CHEMISTRY

PAST PAPERS

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12TH CLASS

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CHEMISTRY

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CHAPTER NO:1
PERIODIC CLASSIFICATION OF ELEMENTS AND PERIODICITY
OBJECTIVES (MCQ'S)
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No 1.1: Introduction, Historical background

1. In the Medeleev's periodic law the properties of elements are periodic function of their:
(a) Volume (b) Densities (c) Atomic number (d)Atomic masses
2. The basis of Modern periodic table is:
(a) electron affinity (b) atomic mass (c) ionization energy (d) atomic number
3. The concept of atomic number was introduced by:
(a) Alrazi (b) Mendeleeve (c) Moseley (d) Dobereiner

Topic No 1.2: Modern Periodic Table

4.How many elements are present in 5th period of the periodic table: **(2 times)**
(a) 32 (b) 8 (c) 18 (d) 28
5.The number of A-subgroups present in modern periodic table are:
(a) 8 (b) 7 (c) 6 (d) 5
6. Transition elements in 4th period are:
(a) 18 (b) 10 (c) 8 (d) 6
7.The basis of Modern periodic law is:
(a) electron affinity (b) atomic mass (c) ionization energy (d) atomic number
8. Which is the longest period of periodic table?
(a) 4 (b) 5 (c) 6 (d) 7
9. 6th period contains the number of elements:
(a) 18 (b) 32 (c) 8 (d) 10

Topic No 1.3.1: Periodic Trends in Physical Properties

10. The decrease in atomic sizes is not much prominent across rows containing elements of :
(a) s- Block (b) p- Block (c) d- Block (d) f- Block
11. Keeping in view the size of atoms, which order is the correct one: **(12 times)**
(a) Mg>Sr (b) Ba> Mg (c)Li> Na (d)Cl> I
12. Smaller the size of an ion:
(a) Lesser is the hydration energy (b) Lesser is the polarizing power
(c) Greater in the electron affinity (d) Greater in the energy of hydration
13. Which of the following statement is correct?
(a) Na atom is smaller than Na^+ (b) Na atom is larger than K atom
(c) F atom is smaller than F^- (d) F atom is larger than F^-
14-Mark the correct statement: **(11 Times)**
(a) Na^+ is smaller than Na atom (b) Na^+ is larger than Na atom
(c)Cl^- is smaller than Cl atom (d) Cl^- (ion) and Cl (atom) are equal in size
15. Keeping in view the size of atoms, which order is the correct one: **(7 times)**
(a) Mg >Sr (b) Ba > Mg (c) Lu >Ce (d) Cl> I
16- Keeping in view the size of atoms which order is correct.
(a) N > P (b) Br > I (c)Ca> Be (d) Mg >Sr

Topic No 1.3.2: Ionization Energy

17. Which of the following elements has lowest ionization energy: **(2 times)**
(a) Beryllium (b) Boron (c) Carbon (d) Oxygen
18- Among the elements of VA group which has highest ionization energy: **(3 times)**
(a) Nitrogen (b) Phosphorus (c) Antimony (d) Bismith
19. The ionization energy of calcium is: **(3 times)**
(a) Lower than that of Barium (b) Lower than that of Magnesium
(c) Higher than that of Beryllium (d) Lower than that of Strontium

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السلام علیکم ورحمۃ اللہ وبرکاتہ:

معزز ممبران: آپ کا وٹس ایپ گروپ ایڈ من "**اردو بکس**" آپ سے مخاطب ہے۔

آپ تمام ممبران سے گزارش ہے کہ:

- گروپ میں صرف PDF کتب پوسٹ کی جاتی ہیں لہذا کتب کے متعلق اپنے کمنٹس / ریویوز ضرور دیں۔ گروپ میں بغیر ایڈ من کی اجازت کے کسی بھی قسم کی (اسلامی وغیر اسلامی، اخلاقی، تحریری) پوسٹ کرنا سختی سے منع ہے۔
- گروپ میں معزز، پڑھے لکھے، سلجھے ہوئے ممبرز موجود ہیں اخلاقیات کی پابندی کریں اور گروپ رولز کو فالو کریں بصورت دیگر معزز ممبرز کی بہتری کی خاطر ریموو کر دیا جائے گا۔
- کوئی بھی ممبر کسی بھی ممبر کو انباکس میں میسیج، مس کال، کال نہیں کرے گا۔ رپورٹ پر فوری ریموو کر کے کاروائی عمل میں لائے جائے گی۔
- ہمارے کسی بھی گروپ میں سیاسی و فرقہ واریت کی بحث کی قطعاً کوئی گنجائش نہیں ہے۔
- اگر کسی کو بھی گروپ کے متعلق کسی قسم کی شکایت یا تجویز کی صورت میں ایڈ من سے رابطہ کیجئے۔
- سب سے اہم بات:

گروپ میں کسی بھی قادیانی، مرزائی، احمدی، گستاخِ رسول، گستاخِ امہات المؤمنین، گستاخِ صحابہ و خلفائے راشدین حضرت ابو بکر صدیق، حضرت عمر فاروق، حضرت عثمان غنی، حضرت علی المرتضیٰ، حضرت حسنین کریمین رضوان اللہ تعالیٰ اجمعین، گستاخ اہلبیت یا ایسے غیر مسلم جو اسلام اور پاکستان کے خلاف پراپیگنڈا میں مصروف ہیں یا ان کے روحانی و ذہنی سپورٹرز کے لئے کوئی گنجائش نہیں ہے لہذا ایسے اشخاص بالکل بھی گروپ جوائن کرنے کی زحمت نہ کریں۔ معلوم ہونے پر فوراً ریموو کر دیا جائے گا۔

- تمام کتب انٹرنیٹ سے تلاش / ڈاؤنلوڈ کر کے **فری آف کاسٹ** وٹس ایپ گروپ میں شیئر کی جاتی ہیں۔ جو کتاب نہیں ملتی اس کے لئے معذرت کر لی جاتی ہے۔ جس میں محنت بھی صَرف ہوتی ہے لیکن ہمیں آپ سے صرف دعاؤں کی درخواست ہے۔
- عمران سیریز کے شوقین کیلئے علیحدہ سے عمران سیریز گروپ موجود ہے۔
- **لیڈیز کے لئے الگ گروپ کی سہولت موجود ہے جس کے لئے ویریفکیشن ضروری ہے۔**
- اردو کتب / عمران سیریز یا سٹڈی گروپ میں ایڈ ہونے کے لئے ایڈ من سے وٹس ایپ پر بذریعہ میسیج رابطہ کریں اور جواب کا انتظار فرمائیں۔ برائے مہربانی اخلاقیات کا خیال رکھتے ہوئے موبائل پر کال یا ایم ایس کرنے کی کوشش ہر گز نہ کریں۔ ورنہ گروپس سے تو ریموو کیا ہی جائے گا بلاک بھی کیا جائے گا۔

نوٹ: ہمارے کسی گروپ کی کوئی فیس نہیں ہے۔ سب فی سبیل اللہ ہے

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اللہ تبارک تعالیٰ ہم سب کا حامی و ناصر ہو

Topic No 1.3.4: Metallic Character

20.Choose the correct statement. **(4 times)**

(a) Metallic character increase down the group

(b) Metallic character decrease down the group

(c)does not change (d) First increase then decrease

Topic No 1.3.5: Melting and Boiling Points

21.Which of the following element has lowest melting point:

(a) Beryllium (b) Magnesium (c) Calcium (d) Barium

22. Which of the following has the highest boiling point:

(A) Be (B) Ra (C) Ba (D) Rn

Topic No 1.3.7: Electrical Conductance

23. Mark the correct statement: **(4 times)**

(A) All lanthanides are present in the same group

(B) All Halogens are present in the same period

(C) All the alkali Metals are present in the same group

(D) All the noble gases are present in the same period

24.Which statement is incorrect: **(5 times)**

(a) All the metals are good conductor of electricity

(b) All metals are good conductor of heat

(c) All the metals form positive ions (d) All the metals form acidic oxide

Topic No 1.3.8: Hydration Energy

25. Which ion will have maximum value of heat of hydration? (5 times)

(A) Na^{+1} (B) Cs^{+} (C) Ba^{+2} (D) Mg^{+2}

26. Which of the following ion has maximum hydration energy:

(A) Li^{+} (B) Na^{+} (C) K^{+} (D) Ca^{+2}

Topic No 1.4: Periodic Relationship in Compounds

27. The intermediate Hydride is:

(a)CsH (b) ZnH_2 (c) BH (d) HF

28. Which one is ionic hydride?

(a)NaH (b) AlH_3 (c) NH_3 (d) CH_4

29. The hydrides of group I-A are:

(a) ionic (b) covalent (c)metallic (d) interstitial

30. Which of the following metal gives an amphoteric oxide? **(2 times)**

(a)Ca (b) Fe (c) Cu (d) Zn

31. Coinage metals are present in the periodic table in group.

(a) I- A (b) I- B (c) II- A (d)II-B

32.The oxides of non-metals are:

(a)acidic (b) amphoteric (c) basic (d) neutral

33. Which one is amphoteric oxide?

(a) SO_3 (b) CaO (c)ZnO (d) Li_2O

34. Zinc Oxide is an example of: **(3 Times)**

(a) Neutral (b) Amphoteric (c) Acidic (d) Basic

35.Which one of the following elements forms weakly acidic oxide:

(a) Aluminium (b) Phosphorous (c)Sulphur (d) Chlorine

36. The element which forms Amphoteric oxide is: **(2 times)**

(a) Beryllium(Be) (b) Sodium(Na) (c) Magnesium(Mg) (d) Calcium(Ca)

37. Which of the following form amphoteric oxide:
(a) Na (b) Mg (c) O (d) Zn

38. Which oxide is amphoteric in nature?
(a) Al_2O_3 (b) Cl_2O_7 (c) MgO (d) SO_3

39. The oxides of Beryllium are: **(3 times)**
(a) acidic (b) basic (c) amphoteric (d) none of these

40. Aluminium oxide is :
(a) Acidic oxide (b) Basic oxide (c) Amphoteric oxide (d) None of these

41. Which of the element gives acidic oxide?
(a) N (b) As (c) Sb (d) Bi

42. Which of the following elements form acidic oxide only?
(a) Cd (b) Al (c) Sn (d) Br

43. Amphoteric oxide is formed by:
(a) Ca (b) Fe (c) Zn (d) Cu

44. Aluminium oxide is: **(3 times)**
(a) Amphoteric (b) Basic (c) Acidic (d) Neutral

Topic No 1.5: Position of Hydrogen in Periodic Table

45. Hydrogen resembles in properties with groups:
(a) I-A, V-A, VII-A elements (b) I-A, IV-A, VII-A elements
(c) I-A, III-A, V-A elements (d) I-A, II-A elements

46. The most metallic element from the following is:
(a) Nitrogen (b) Oxygen (c) Antimony (d) Bismuth

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47. Alkali metals are:
(a) Acidic in nature (b) Amphoteric nature
(c) Strong oxidizing agent (d) Strong reducing agents

48. Non-metals are present in which block of periodic table?
(a) s-block (b) p-block (c) d-block (d) f-block

49. Which is more acidic oxide in the following?
(a) MnO (b) Mn_2O_3 (c) MnO_2 (d) Mn_2O_7

50. Which one is not a periodic property:
(a) Ionization Energy (b) Density (c) Atomic Radii (d) Hydration Energy

51. Which one of the following oxides is more basic:
(a) BeO (b) SrO (c) CaO (d) MgO

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52. Mark the correct statement:
(a) Metallic character increases down the group
(b) Metallic character increases from left to right along a period
(c) Metallic character remains the same from left to right along a period
(d) Metallic character remains the same down the group.

53. An aqueous solution of an organic compound reacts with Na_2CO_3 to produce CO_2 gas. Which one of the following could be organic compound
(a) $CH_2=CH-CH_3$ (b) CH_3CH_2COOH (c) CH_3COCH_3 (d) CH_3CHO

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	C	C	A	B	D	C	B	C	B	D	C	A	B	C
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
B	A	B	A	B	A	C	D	D	D	B	A	A	D	B	A
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
C	B	B	A	D	A	C	C	A	D	C	A	B	D	D	B
49	50	51	52	53											
D	B	B	A	B											

Chapter No:1
Periodic Classification of Elements and periodicity
SHORT ANSWERS
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No 1.1: Introduction, Historical Background

1. What is Dobereiner's Law of triads?

Ans: Dobereiner a German chemist in 1829, arranged elements in groups called Triads, as each contained three elements with similar properties.

e.g Li_7 Na_{23} K_{39} = $\frac{7+39}{2}=23$

2. What is Newlands'law of octaves?

Ans: Newland who was English chemist, in 1864, classified 62 elements, known at that time, in increasing order of their atomic masses. He noted that every eighth element had some properties in common with the first one. The principle on which this classification is based was called the Law of Octaves.

3. Give two defect of Mendeleev's periodic table. **(3 times)**

Ans: Two defect of Mendeleev's periodic table:

(i). It was based upon the atomic masses of elements which is not the fundamental property of elements.

(ii). It does not explain the position of isotopes.

(iii). It does not explain the wrong order of atomic masses of elements.

4. StateMendeleev's periodic law. What improvements were made in Mendeleev's periodic table.

Ans: Mendeleev's periodic law:- If elements are arranged according to increasing atomic masses, their properties repeate after regular intervals.

Improvements made in Mendeleev's periodic table:

i. Modern Periodic law: if elements are arranged according to icreasing atomic numbers, their properties repeat after regular intervals.

ii. An extra group Viii A for noble gases was introduce.

5. *Zn, Cd, Hg* were placed with alkaline earth metals in Mendeleev's table. How this confusion is removed in the Modem Periodic Table?(2 Times)

Ans: Removal of confusion:Zn, Cd, Hg were placed in a single vertical group, while according to their properties they belonged to two different categories. The same was true for so many other elements placed in the same vertical group in modern periodic table, the confusion was removed by dividing the elements in two types of vertical groups, A and B. In modern periodic table, Be, Mg, Ca, Sr and Ba are placed in group IIAand Zn, Cd, Hg in group IIB.

Topic No 1.2: Modern Periodic Table

6. What is modern periodic table.

Ans: Modern periodic table:The table of elements in which all the elements are arranged in ascending order of their atomic numbers having seven periods and eighteen groups is called modern periodic table.

7. Describe 2nd and 3rd period of periodic table.

Ans: The periods 2 and 3 contain eight elements each and are called short periods. All the elements in these periods are representatative elements and belong to A subgroup. In these periods, every eighth element resemebles in properties with the first element. As lithium and beryllium in the 2nd period resembles in most of their properties with sodium and magnesium of the 3rd period, respectively. Similarly, boron and alumninum both show oxidation state of +3, fluorine in 2nd period has close resemblances with chlorine of 3rd period.

8. Describe 7th period of modern periodic table.

Ans: This period is incomplete. This contains only two normal elements Fr and Ra, ten transition elements and fourteen inner transition elements. The inner transition elements of this period are called "Actinides", as they starts after Ac(Actinium).

The actinides are also shown at the bottom of the periodic table under the Lanthanides. Due to their scarcity, the inner transition elements are also called "Rare Earth Elements".

9. What is lanthanide contraction? / Lanthanide contraction controls the atomic sizes of elements of 6th and 7th periods. (6 times)

Ans: Lanthanide contraction: The atomic number increases from left to right, the atomic radius decreases. This gradual decrease in the radius is due to increase in positive charge in the nucleus. As the positive charge increases, the negatively charged electrons in the shell are pulled closer to the nucleus. Thus the size of the outer most shell becomes gradually smaller. This effect is quite remarkable in the elements of longer periods in which "d" and "f" subshells are involved. For example the gradual reduction in the size of Lanthanides is significant and called Lanthanide Contraction.

10. How the classification of elements in different blocks help in understanding their chemistry?

Ans: The block division of the periodic table is based upon valence orbital of the element involved in chemical bonding. This classification is quite useful in understanding the chemistry of elements and predicting their properties especially the concept of valency or oxidation state.

11. Write a short note on blocks in periodic table.

Ans: Blocks in periodic table: Elements in the periodic table can be classified into four blocks, this classification is based upon the valence orbital of the element involved in chemical bonding. According to this classification. Elements of IA and IIA subgroups are called s-block elements. The elements for IIIA to VIIIA subgroups are known as p-block elements as their valence electrons are present in p orbital. Similarly in transition elements, electrons are in d orbital are responsible for their valency hence they are called d- block elements . For Lanthanides and Actinides valence electrons are present in f orbital hence these elements are called f- block elements.

12. Define metalloid.

Ans: Metalloid : Some elements, especially lower members of groups, IIIA, IVA and VA have properties of both metals as well as non-metals. These elements are called metalloids.

13. d and f block elements are called transition elements. Give reasons. (1 time)

Ans: d and f block elements are located in between s and p block elements in the periodic table. Their properties are also in between s and p block elements and they vary from left to the right. It means that their properties show a transition in a systematic way. In d block elements d-d transition occur and elements exhibit colours. Similarly in f block elements d and f orbital show transition of elements hence these are called inner transition elements. That is why they are called as transition elements.

14. Give essential features of period four (4) in modern periodic table? (2 time)

Ans: Essential features of period four:

Period four is called long period. It consists of 18 elements. Out of these eight are representative elements belonging to A subgroup similar to second and third period. Where as the ten elements placed in the center of the table belonging to B subgroup and are known as transition elements.

Topic No 1.3: Periodic Trends in Physical Properties

15. Define atomic radius? Why atomic radius of alkali metals increases in group of periodic table

Ans: Atomic radius:

Half the distance between the center of the two bonded atoms is called atomic radius. Atomic radius increases from top to bottom in a group of periodic table, this is because of addition of extra shell of electrons in each period.

16. Why melting and boiling points of elements belonging to groups VA –VIIA are lower? (2 times)

Ans: Melting and boiling points of elements belonging to groups VA –VIIA are lower because elements of these groups exist as small, covalent molecules, rather than

as three dimensional lattices having very weak intermolecular forces between them. Consequently, their melting and boiling points are extremely low.

Topic No 1.3.1: Ionic Radii

17. Ionic radii of negative ion is always bigger in size than its parent atom. Why? / Why anionic radius is greater than parent atom? / Why the size of an anion is larger than its neutral atom? (11 times)

Ans: The reason is that addition of one or more electrons in the shell of a neutral atom enhances repulsion between the electrons causing expansion of the shell. For example the radius of fluorine atom is 72 pm and that of the fluoride ion F^- ion is 136 pm.

18. The ionic radius of positive ion is smaller than its parent atom. Give reason. (2 time)

Ans: The removal of electrons causes an imbalance in proton-electron ratio. Due to greater attraction of the nuclear charge, the remaining electrons of the ion are drawn closer to the nucleus. Thus, a positive ion is always smaller than the neutral atom from which it is derived. The radius of Na is 157pm and the radius of Na^+ is 95pm.

Topic No 1.3.2: Ionization Energy

19. Discuss the trend of ionization energy in periodic table. (3 times)

Ans: <u>Trend of ionization energy in periodic table:</u> In groups ionization energy decrease from top to bottom because size of atom and number of electrons causing the shielding effect also increases.

- In period by moving from left to right the outer shell remains the same while the nuclear charge increases effectively that makes the removal of an electron difficult and hence the value of ionization energy increases.

20. Why the ionization energies decreases down the groups? (3 times)

Ans: Going down in the group, the nuclear charge increases but as the size of the atom and the number of electrons causing the shielding effect also increases therefor ionization energy decreases from top to bottom.

21. Ionization energy increases from left to right in a period. Justify the statement.

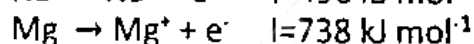
Ans: In period by moving from left to right the outer shell remains the same while the nuclear charge increases effectively that makes the removal of an electron difficult and hence the value of ionization energy increases.

22. Ionization energy of Al^{3+} is greater than Mg^{2+}. Give the reason. (2 times)

Ans: By moving from left to right in a period, the outer shell remains the same, while the nuclear charge increases effectively that makes the removal of an electron difficult and hence the value of ionization energy increases. Similarly the size of Al is smaller than Mg so Al^{3+} it has greater ionization energy than Mg^{2+}.

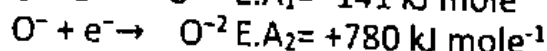
23. Why first ionization energy of Mg is greater than that of Na? (2 times)

Ans: By moving from left to right in a period, the outer shell remains the same, while the nuclear charge increases effectively that makes the removal of an electron difficult and hence the value of ionization energy increases. Similarly the size of Mg is smaller than Na so Mg has greater ionization energy than Na e.g.

$$Na \rightarrow Na^+ + e^- \quad I=496\ kJ\ mol^{-1}$$
$$Mg \rightarrow Mg^+ + e^- \quad I=738\ kJ\ mol^{-1}$$

Topic No 1.3.3: Electron Affinity

24. Why the second value of electron affinity of an element is usually shown with a positive sign. (5 times)

Ans: Energy usually released when electronegative elements absorb the first electron and E.A. in such case is expressed in negative figure, as in the case of halogens. When a second electron added to a uni-negative ion, the incoming electron is repelled by the already present negative charge and energy is absorbed in this process.

$$O + e^- \rightarrow O^- \quad E.A_1 = -141\ kJ\ mole^{-1}$$
$$O^- + e^- \rightarrow O^{-2} \quad E.A_2 = +780\ kJ\ mole^{-1}$$

25. Define electron affinity. Give its trend in periodic table. **(7 times)**

Ans: **Electron affinity:** Energy released or absorbed, when an electron is added to a gaseous atom to form a negative ion is called electron affinity.

Trend of electron affinity in periodic table: Electron affinity generally increases with increasing atomic number within a period and decreases from lighter to heavier elements in a given group of the periodic table.

26. The first electron affinity of oxygen is negative, but the second is positive. Why?

OR **Why 1st electron affinity is negative and 2nd is positive?** **(7 times)**

Ans: Energy usually released when electronegative elements (like oxygen) absorb the first electron and E.A. in such cases is expressed in negative figure. When a second electron is added to a uni-negative ion, the incoming electron is repelled by the already present negative charge and energy is absorbed in this process. So it is represented in positive sign.

$O + e^- \rightarrow O^-$ $E.A_1 = -141$ kJ mole^{-1}

$O^- + e^- \rightarrow O^{-2}$ $E.A_2 = +780$ kJ mole^{-1}

27. Solution of Na_2O in water is alkaline. Justify the statement. **(2 times)**

Ans: Alkali metal oxides dissolve in water to give alkaline solutions. For example:

$Na_2O + H_2O \rightarrow 2NaOH$

The reaction of alkali metal oxide with water is an acid-base reaction. The reaction involved the decomposition of water molecule by an oxide ion as:

$O^{2-} + H_2O \rightarrow 2OH^-$

Topic No 1.3.4: Metallic Character

28. Why metallic character increases from top to bottom in a group of metals? **(7 times)**

Ans: Metallic character increases from top to bottom in a group because from top to bottom atomic size of atoms increases and it is easier to remove the electron of an atom bigger in size.

Topic No 1.3.5: Melting and Boiling Points

29. Melting points of Group VIIA elements increases down the group. Why?

Ans: For elements of group VIIA, which exist in the form of molecules, the melting and boiling points increase down the group. This is because large molecules exert stronger force of attraction due to their higher polarizabilities.

30. How melting and boiling points varied in a period? **(3 time)**

Ans: Across the short periods, the melting and boiling points of elements increase with the number of valance electrons up to group IVA and then decrease up to the noble gases. The melting points of group IA element are low because each atom in them provides only one electron to for a bond with other atom. Melting points of group IIA elements are considerable higher than those of group IA elements because each atom in them provides two binding electrons.

Carbon has maximum number of binding electrons, thus it has very high melting point.

An important change occurs when we move from group IVA to group VA, VIA, VIIA as the lighter elements of these group exist as small covalent molecules. Rather than as three dimensional lattices.

30. Why do boiling point of halogens increase down the group in periodic table?

Ans: Boiling point of halogens increase down the group in periodic table because halogens exist in the form of molecules and large molecules exert stronger London forces of attraction due to their higher polarizabilities.

Topic No 1.3.6: Oxidation State

31. Why the oxidation state of noble gases is usually zero? **(7 times)**

Ans: Group VIII A elements, which are also called zero group elements usually show zero oxidation state because there is no vacancy in their outer most shell to accommodate more electrons.

32. The oxidation states vary in a period, but remain almost constant in a group. Give reason. **(6 times)**

Ans: The number of electrons in outermost shells goes on changing in periods from left to the right, so oxidation states go on changing. The number of electrons in

the outermost shells remain the same in a group, so the oxidation states remains the same. Anyhow, the process of un pairing of electrons may happen in a group and oxidation states may change.

33. How do member of group VI-A(except oxygen) show+4and+6 oxidation state?

Ans: Elements of group VI-Aexcept oxygen show covalency of +2,+4 and +6.+2 oxidation shown due to 2 unpaired electrons in the p orbitals. +4 oxidation state is shown when 1 electron from p-orbital is promoted to the next vacant d-orbital, while +6 oxidation state is shown when another electron from s-orbital is also promoted to the next vacant d-orbital.

34. Why the elements of group VI A other than oxygen show more than two oxidation states?

Ans: Elements of group VI-A except oxygen show covalency of +2,+4 and +6.+2 oxidation shown due to 2 unpaired electrons in the p orbitals. +4 oxidation state is shown when 1 electron from p-orbital is promoted to the next vacant d-orbital, while +6 oxidation state is shown when another electron from s-orbital is also promoted to the next vacant d-orbital.

Topic No 1.3.7: Electrical Conductance

35. Why do metals conduct electricity?

Ans: **Metals conduct electricity:** Metals conduct electricity because metals have loose (free) electrons in their outer most shell and there is an ease of their movement in the solid lattice.

36. Why diamond is a non-conductor and graphite is fairly a good conductor? (6 times)

Ans: Carbon in the form of diamond is non-conductor because all of its valence electrons are tetrahedrally bound and unable to move freely, while in the form of graphite, carbon is fairly good conductor because one of its four valence electrons is relatively free to move.

37. Electrical conductance of metals in group IA generally increases from top to bottom. Explain (2 times)

Ans: The property is mainly due to the presence of relatively loose electrons in the outermost shell of the elements and ease of their movement in the solid lattice. In group IA , generally electrical conductance increases from top to bottom because from top to bottom loosely held electrons are more easily available.

38. Why the metals are good conductors?

Ans: Metals are good conductors due to the presence of relatively loose electrons in the outermost shell of the element and ease of their movement in the solid lattice.

Topic No 1.3.8: Hydration Energy

39. Give reason that Hydration Energy of Al^{3+} ions is more than Mg^{2+} ions. (2 times)

Ans: Hydration energy is highly depends upon charge to size ratio of the ions. Charge to size ratio increases from left to right in a period, the hydration energy also increases in the same fashion.

40. Hydration energy depends on charge density of ion. Justify the statement.

Ans: Hydration energy depends on charge to size ratio of the ion. For example of group IA, charge to size ratio decreases from top to bottom in a group, the hydration energy also decreases in the same fashion.

41. Hydration energy decreases from top to bottom, why?

Ans: **Trend of Hydration energy:**
Hydration energy highly depend upon charge to size ratio of the ions. Charge to size ratio decreases from top to bottom in a group.

Topic No 1.4: Periodic Relationship in Compounds

42. What are halides? Give their types.

Ans: **Halides:**
Halides are the binary compounds which halogens formed with other elements. Halides are classified in two general groups ionic and covalent. In between the two, there is another class of halides in which halogen atom acts a bridge

between the two atoms of the other element, such halides are termed as Polymeric halides.

43. Why the ionic character of halids decrease from left to the right in periods. (2 times)

Ans: Within a period, isoelectronic positive ions show a decrease in ionic radius from left to right, because of the increasing nuclear charge. The same trend is observed for the isoelectronic negative ions of a period: ionic size decreases from left to right.

44. Alkali metals give ionic hydrides. Give brief reason. (2 times)

Ans: As alkali metals are highly electropositive. These are unipositive elements as M^+. These can make ionic bonds with negative ions. Hydrides acts as anion and make ionic bond with alkali metals by making ionic hydrides. Alkali metals form ionic hydrides, which contains hydride ion H^-.

45. Write two properties of covalent hydrides. (2 times)

Ans: **Properties of covalent hydrides:** Covalent hydrides are usually gases or volatile liquids. They are non-conductors and dissolve in organic solvents . Their bond energies depend on the size and the electronegativity of the element.

46. What are Ionic Hydrides? Give Example.

Ans: **Ionic Hydrides:** The elements of group IA and the heavier members of group IIA from ionic hydrides, which contain H^- (Hydride) ion. These hydrides are crystalline solid compounds, with high melting and boiling points and which conduct electricity in molten state. For example LiH, NaH, KH, RbH andCsH are ionic hydrides.

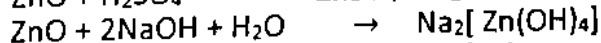
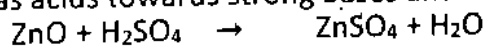
47. Explain basic character of oxides increase down the group .

Ans: The basicity of main group metal oxides increases on decreasing a group of the periodic table, ($BeO < MgO < CaO < SrO < BaO$).

48. Prove with chemical reactions that ZnO behaves as amphoteric oxide. (5 times)

Ans: ZnO is an oxide of less electropositive element (Zn). It behaves as amphoteric oxide as acids towards strong bases and as base towards strong acids.

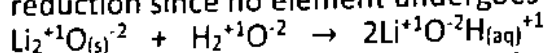
$$ZnO + H_2SO_4 \rightarrow ZnSO_4 + H_2O$$

$$ZnO + 2NaOH + H_2O \rightarrow Na_2[Zn(OH)_4]$$

49. Write a brief account of oxides of s-block elements.

Ans: **Oxides of s-block elements:** Oxides of s-block (alkali and alkaline earth metals) except beryllium are basic and contains O^{-2} ions. The O^{-2} ion has high affinity for proton and cannot exist alone in an aqueous solution. Therefore, it immediately takes proton form water and forms OH^-ions.

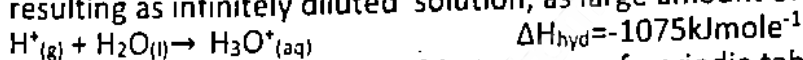
50. Justify the chemical reaction that reaction of alkali metal oxide with water is Acid-Base reaction

Ans: Reaction of alkali metal oxide with water is Acid-Base reaction not an oxidation reduction since no element undergoes a change in oxidation state.

$$Li_2^{+1}O_{(s)}^{-2} + H_2^{+1}O^{-2} \rightarrow 2Li^{+1}O^{-2}H_{(aq)}^{+1}$$

51. Define hydration energy. How it varies is group in periodic table? (2 times)

Ans: **Hydration energy:** The hydration energy is the heat absorbed or evolved when one mole of gaseous ions dissolve in water to give an infinitely diluted solution.

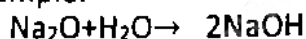
Example: One mole of gaseous hydrogen ions are dissolved in water resulting as infinitely diluted solution, as large amount of heat is liberated:

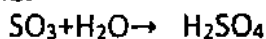
$$H^+_{(g)} + H_2O_{(l)} \rightarrow H_3O^+_{(aq)} \qquad \Delta H_{hyd} = -1075 kJmole^{-1}$$

Trend in group of periodic table: In group of periodic table it decreases because charge to size decreases from top to bottom in a group.

52. Why Na_2O is basic while SO_3 is acidic in nature?

Ans: **Na_2O is basic while SO_3 is acidic:**

Alkali metal oxides dissolve in water to give alkaline solutions so Na_2O is basic. For example:

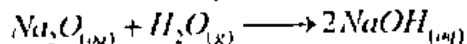
$$Na_2O + H_2O \rightarrow 2NaOH$$

While SO_3 dissolve in water to give acidic solutions so SO_3 is acidic in nature. For example:

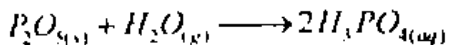
$$SO_3 + H_2O \rightarrow H_2SO_4$$

53. What are amphoteric oxides? Give one example.

Ans: The type of oxides which show both acidic and basic properties, these oxides are called amphoteric oxides. For example oxides of zinc, alllminium, germanium are amphotric oxides.

54. Why Na_2O is basic while P_2O_5 is acidic?

Ans: Na_2Oproduce sodium hydroxide when react with water which is a base :

$$Na_2O_{(aq)} + H_2O_{(g)} \longrightarrow 2NaOH_{(aq)}$$

P_2O_5produce phosphoric acid when react with water which is an acide :

$$P_2O_{5(s)} + H_2O_{(g)} \longrightarrow 2H_3PO_{4(aq)}$$

Topic No: 1.5: Posion of Hydrogen in Periodic Table:

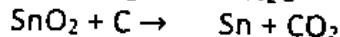
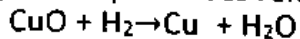
55. Hydrogen can be placed over elements of VII A group. Justify (2 times)

Ans: (i). Hydrogen is a gas like most of halogens and is stable in diatomic form like halogens (F_2,Cl_2 and Br_2).

(ii). Halogens required one electron to complete its outermost shell like hydrogen, by accepting one electron hydrogen forms H^-(hydride ion) similar to F^-, Cl^-, Br^-.

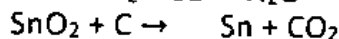
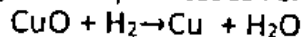
56. How does hydrogen resemble with the element of group IV-A? (6 times)

Ans: Some of the characteristic properties of hydrogen also resembles with those of group IVA elements such as C and Si, etc. For example, valence shell of hydrogen is half filled like those of group IVA elements. Both, hydrogen and group IVA elements combine with other elements through covalent bonding. Like carbon, hydrogen also possesses remarkable reducing properties.

$$CuO + H_2 \rightarrow Cu + H_2O$$
$$SnO_2 + C \rightarrow Sn + CO_2$$

57. Justify that carbon and hydrogen are both reducing agents.

Ans: **Carbon and hydrogen are both reducing agents:**

Some of the characteristic properties of hydrogen also resembles with those of group IVA elements such as C and Si, etc. For example valence shell of hydrogen is half filled like those of group IVA elements. Both, hydrogen and group IVA elements combine with other elements through covalent bonding. Like carbon, hydrogen also possesses remarkable reducing properties.

$$CuO + H_2 \rightarrow Cu + H_2O$$
$$SnO_2 + C \rightarrow Sn + CO_2$$

58. How do you justify the position of hydrogen at the top of group I-A of periodic table? Write at least four points. (2 times)

Ans: **Position of hydrogen at the top of group I-A of periodic table:**

(i) Like alkali metals hydrogen atom has one electron in the outermost (valence) shell which it can lose to form H^+.

(ii) Both hydrogen and alkali metals have a strong tendency to combine with electronegative elements such as halogens.

(iii) Similar to alkali metals hydrogen also forms ionic compounds.

(iv). Ionic compounds of hydrogen dissociated in water like ionic compounds of alkali metals.

59. In what respects does hydrogen differ from halogens? Write down two dissimilarities.

Ans: (i). Hydrogen forms H^+ ion by losing its valence electron but halogens do not form positive ions.

(ii). Hydrogen combine with oxygen and form stable oxides while halogens lack this property.

60. Name various classes of hydrides.

Ans: According to the nature of bonding, hydrides may be broadly classified into three classes: ionic, covalent and intermediate.

61. Write any two resemblances of Hydrogen with Alkali Metals (3 times)

Ans: Hydrogen is placed at the top of the group IA . This is because of the fact that some of the properties of hydrogen resembles with those of alkali metals. Like alkali metal hydrogen atom has one electron in 1s subshell, which it can lose to form H^+. Both hydrogen and alkali metals have a strong tendency to combine with

electronegative elements such as halogens. Similar to alkali metals hydrogen also forms ionic compounds, which dissociate in water.

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62. Define periodic Table. How many periods and groups are present in it?

Ans: Periodic Table:

A table obtained by the arrangement of elements into periods and groups is called Periodic table.

- There are 18 groups and 7 periods in Modern periodic table.

63. Define Mendeleev's periodic law, modern periodic law.

Ans: Mendeleev's periodic law:

"If elements are arranged in the ascending order of their atomic masses their properties repeat in regular or periodic manner."

Modern Periodic Law:

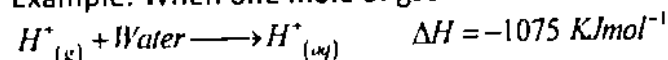
"If elements are arranged in the ascending order of their atomic number, their properties repeat in periodic manner."

64. What is hydration energy. Give an example.

Ans: **Hydration energy:**

"Amount of energy evolved or absorbed when one mole of gaseous ions dissolved in water to make an infinitely dilute solution".

Example: When one mole of gaseous H^+ ions are dissolved in water.

$$H^+_{(g)} + Water \longrightarrow H^+_{(aq)} \qquad \Delta H = -1075\ KJmol^{-1}$$

65. Define Lanthanides and actinides.

Ans: **Lanthanides:**

The elements start after Lanthanum $\left({}_{57}La\right)$ in sixth period are called Lanthanides.

There are 14 elements called Lanthanides from Ce to Lu.

Actinides:

The elements start after actinum $\left({}_{89}Ac\right)$ in seventh period are called actinides.

They are also 14 elements from Th to Lr.

66. Why Fluorides have the highest lattice energies among the pure ionic compounds. Give two reasons.

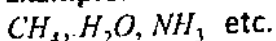
Ans. Ionic fluorides like LiF, NaF, KF have greater %age of ionic character due to small size of F and its highest electronegativity value.

Due to this reason strong ionic bond is present in fluorides of alkali and alkaline earth metals. Therefore, they have high lattice energies.

67. Define "covalent hydrides", with one example.

Ans: Binary compounds of hydrogen with non-metals in which hydrogen is bonded by covalent bond are called covalent hydrides.

Example:

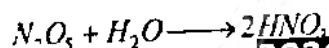
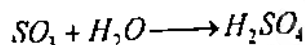
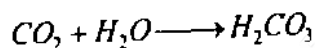
CH_4, H_2O, NH_3 etc.

68: Oxides of non-metals show acidic behavior, give reason.

Ans: Oxides of non-metals such as C, N, P, S etc are acidic because when these are dissolved in water, they form acids.

For Example:

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

$$SO_3 + H_2O \longrightarrow H_2SO_4$$

$$N_2O_5 + H_2O \longrightarrow 2HNO_3$$

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69. The hydration energies of the ions are in the following order $Al^{3+} > Mg^{2+} > Na^+$. Justify.

Ans: Hydration energy of an ion depends upon the charge density. Greater the charge density, greater the hydration energy. Al^{3+}, Mg^{2+}, Na^{1+} have same number of electrons, but different number of protons. Al^{3+} has maximum charge density due

to 13 protons 10 electrons, and +3 charge. Na^+ has least charge density because it has 11 protons, 10 electrons and +1 charge.

70. What is the role of shielding effect on ionization energy?

Ans: There is inverse relationship between ionization energy and shielding affect. As shielding effect increases ionization energy decreases.

$$\text{Ionization energy} = \frac{1}{\textit{Shielding effect}}$$

71. Why Second ionization Energy is higher than First ionization Energy?

Ans: The Second ionization Energy is higher than First ionization Energy. The reason is that after removal of one electron from the valance shell of an isolated gaseous atom, the hold of nucleus on remaining electron increases that's why it is difficult to remove second electron from the valance shell means, greater ionization enrgy will be required.

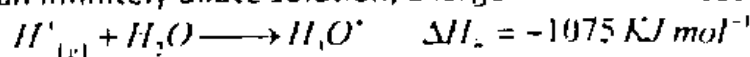
$$Mg \longrightarrow Mg^{+} + 1e^{-} \qquad I.E_1 = 738\ KJ/mol$$

$$Mg^{+} \longrightarrow Mg^{2+} + 1e^{-} \qquad I.E_2 = 1451\ KJ/mol$$

72. Define Hydration Energy. Give example also.

Ans: The hydration energy is the heat absorbed or evolved when one mole of gaseous ions dissolve in water to give an infinitely dilute solution.

For example, when one mole of gaseous hydrogen ions are dissolved in water resulting an infinitely dilute solution, a large amount of heat is liberated:

$$H^{+}_{(g)} + H_2O \longrightarrow H_3O^{+} \qquad \Delta H_h = -1075\ KJ\ mol^{-1}$$

73. Write essential features of 4th and 5th Period in Periodic Table.

Ans: The periods 4 and 5 are called long periods Each long period consists of eighteen elements. Out of these, eight are representative elements belonging to A subgroup similar to second and third periods. Whereas the other ten elements, placed in the centre of the table belong to B subgroups and are known as transition elements. In these periods, the repetition of properties among the elements occurs after 18 elements. As after ${}_{19}K$ (having atomic number 19) the next element with similar properties is ${}_{37}Rb$.

74. Describe some families in Periodic Table.

Ans: Due to their peculiar characteristics, some typical elements belonging to sub-groups A, have also been assigned family names.

For example,

(i) **Alkali Metals:** Elements of the group IA are called Alkali Metals, because of their property to form strong alkalies with water.

(ii) **Alkaline Earth Metals:** Due to their presence in Earth's crust and alkaline character,the elements of group IIA are known as Alkaline Earth Metals.

(iii) **Halogens:** An important family in the periodic table is Halogen family. The name "Halogens" is given to the elements of group VIIA, due to their salt forming properties.

(iv) **Noble Gases:** As the gases of group VIIIA are least reactive they are called "Noble Gases",These family names are useful for a quick recognition of an element in the periodic table.

75. What are Periods and Groups?

Ans: Groups: Elements with similar properties are placed in vertical columns called Groups. There are eight groups ,which are usually numbered by Roman numerals I to VIII.Each group is divided into two subgroups, designated as A and B subgroups. The subgroups, containing the representative or normal elements are labelled as A subgroups, whereas B subgroup contain less typical elements, called transition elements and are arranged in the centre of the periodic table.

Periods: The horizontal rows of the periodic table are called Periods. There are periods in the periodic table numbered by Arabic numerals 1 to 7

76. Define Ionization energy. How does it vary in periodic table.

Ans: Def: The minimum amount of energy which is required to remove an electron from the outer most shell of an isolated gaseous atom in its ground state.

1. **Period:**
Ionization energy increases from left to right in a period.
Reason:
i. Atomic size decreases from left to right.
ii. Nucleas charge increses from left to right.

2. **Group:**
Ionization energy decreases down the group.
Reason:
i. Atomic size increases from top to bottom.
ii. Nucleas charge decreases from top to bottom.
iii. Shielding effect increases from top to bottom.
iv. Number of shells increases from top to bottom.

Chapter No:1 LONG QUESTIONS
Periodic Classification of Elements and periodicity
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 1.1:

1. What is Mendeleev's periodic table? Discuss improvement in Mendeleev's periodic table. (6 Times)

Ans: (Text Book Page No:2)

Topic No: 1.2:

2. What are periods? Describe different periods of periodic table. (2 times)

Ans: (Text Book Page No:2)

3. Explain main features of Modern Periodic Table. (3 times)

Ans: (Text Book Page No:2)

4. Define group and period. Discuss only the 6th period in detail.

Ans: (Text Book Page No:2+4)

5. Discuss four blocks in modern periodic table. (2 times)

Ans: (Text Book Page No:5)

Topic No:1.3.1

6. Explain periodic trends in the following physical properties. (2 times)
(i) Atomic radius (ii) Electron affinity

Topic No:1.3.2

7. Define ionization energy? How does it differ along the period and down the group ofperiodic table? (5 times)

Ans: (Text Book Page No:6+7)

Topic No:1.3.3

8. Define Electron affinity. How does it vary in groups and periods generally in periodic table? (3 times)

Ans: (Text Book Page No:8)

Topic No:1.3.4

9. Give the periodic trends of ionization energy and electron affinity. (2 times)

Ans: (Text Book Page No:7,8)

10. Describe trend of metallic character in groups and periods and discuss the impact of atomic size on it.

Ans: (Text Book Page No:8)

11. Describe the Metallic and Non- Metallic character of element in periodic table.

Ans: (Text Book Page No:8)

12. **Discuss about oxides of different elements in the periodic table only for metals and non-metals.**

Ans: (Text Book Page No:13)

13. **Write a note on oxides of Alkali and alkaline earth metals.** **(3 times)**

Ans: (Text Book Page No:13)

Topic No:1.3.5

14. **Explain periodic trend in the following physical properties.**
(i) Melting point (ii). Boiling point

Ans: (Text Book Page No:9)

Topic No:1.3.6

15. **Discuss oxidation state of different elements in the periodic table.** **(3 times)**

Ans: (Text Book Page No:9)

Topic No: 1.4

16. **Define hydrides. Classify different types of hydrides with trend in periodic table.** **(2 times)**

Ans: (Text Book Page No:12)

Topic No: 1.7

17. **Explain the variation of (i) Ionization potential (ii) Electrical conduction along periods and groups.** **(2 times)**

Ans: (Text Book Page No:7+10)

18. **Why diamond is non-conductor and graphite is fairly a good conductor?** **(4 times)**

Ans: (Text Book Page No:10)

Topic No: 1.8

19. **Define Hydration Energy. Give example. Explain its trends in periodic table.** **(2 times)**

Ans: (Text Book Page No:11)

20. **Define hydration energy. Discuss the relation of hydration energy with size and charge on the ions.**

Ans: (Text Book Page No:11)

21. **Discuss the position of hydrogen in group IV- A of periodic table.**

Ans: (Text Book Page No:14)

22. **What are halides? Classify them on the basis of nature of bonding. Describe covalent halides in detail.** **(2 times)**

Ans: (Text Book Page No:11)

23. **How hydrogen resembles with group I-A elements and differs group IV-A elements?** **(8 times)**

Ans: (Text Book Page No:15)

24. **Discuss position of hydrogen in group Ist & VII(A) of periodic table.** **(8 times)**

Ans: (Text Book Page No:15)

25. **Define oxides. How are they classified? Give example of each class.** **(5 times)**

Ans: (Text Book Page No:13)

26. **What are hydrides? How are these classified. Also give their physical properties.** **(5 times)**

Ans: (Text Book Page No:12)

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27. **Write down note on ionization energy. Give its variation within groups and periods.**

28. **Define ionization energy, on what factors it depends. Give its periodic trend.**

29. **Give the differences of Hydrogen with group IA, IVA and VIIA elements in the periodic table.**

CHAPTER NO:2 S-BLOCK ELEMENTS
OBJECTIVES (MCQ'S)
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 2.1 Introduction, Occurrence

1. Which one of the following does not belong to alkaline earth metals? (6 times)
(a) Be (b) Ra (c) Ba (d) Rn
2. Elements of group I A are called:
(a) Alkali metals (b) Metalloids (c) Alkaline earth metals (d) Coinage metals
3. Carnalite is the mineral of:
(a) Be (b) Na (c) Mg (d) Ca
4. Elements of group II-A are called:
(a) Coinage Metals (b) Alkali Metals (c) Metalloids (d) Alkaline Earth Metals
5. Which is the least reactive of all alkali metals?
(a) Li (b) Na (c) K (d) Cs
6. The word alkali is derived from which language:
(a) Arabic (b) Greek (c) French (d) German
7. $LiNO_3$ decompose to give products.
(a) $Li_2O + NO_2 + O_2$ (b) $Li_2O + NO + O_2$ (c) $Li_2O + NO$ (d) $Li_2O_2 + NO_2 + O_2$
8. Which is not an alkali metal? (4 times)
(a) Francium (b) Cesium (c) Rubidium (d) Radium
9. Chile salt petre has the chemical formula: (9 times)
(a) $NaNO_3$ (b) KNO_3 (c) $Na_2B_4O_7$ (d) $Na_2CO_3.H_2O$
10. The ore $CaSO_4 .2H_2O$ has the general name: (7 times)
(a) Gypsum (b) Dolomite (c) Calcite (d) Epsom salt

Topic No: 2.2: Peculiar behavior, General properties:

11. Which one of the following elements can from super oxide?
(a) Li (b) Be (c) K (d) Mg
12-Point out the element which forms supper oxide:
(a) Li (b) Na (c) K (d) C
13. Which of the following sulphates is not soluble in water? (4 times)
(a) Sodium Sulphate (b) Potassium Sulphate
(c) Ammonium Sulphate (d) Barium Sulphate
14. Which of the following gas will turn lime water milky?
(a) Cl_2 (b) NO_2 (c) CO (d) CO_2
15. The milk of magnesia is used for the treatment of:
(a) Basicity (b) Rancidity (c) Acidity (d) Jaundice

Topic No: 2.3: Down's cell (Na-metal):

16. $CaCl_2$ is added to NaCl in Down's cell to: (3 times)
(a) decrease solubility (b) decrease dissociation
(c) decrease melting point (d) decrease conductivity
17. Down's cell is used to prepare: (2 times)
(a) Sodium metal (b) Sodium bicarbonate (c) Sodium carbonate (d) Sodium hydroxide
18. Which element is deposited at cathode during electrolysis of brine? (4 times)
(a) Na (b) O_2 (c) Cl_2 (d) H_2

Topic No: 2.4 Nelson's cell (NaOH):

19. Nelson's cell is used to prepare:
(a) NaOH (b) Na_2CO_3 (c) Na metal (d) $NaCl$

Topic No: 2.5: Role of Gypsum in Industry:

20. Plaster of Paris can be obtained from:
(a) Marble (b) Bauxite (c) Gypsum (d) Lime water
21. Which of the following do not form oxide of Nitrogen on heating?
(a) $LiNO_3$ (b) $NaNO_3$ (c) $Ca(NO_3)_2$ (d) $Mg(NO_3)_2$
22. Which one of the following is applied on walls as white wash?
(a) Lime water (b) Quick lime (c) Milk of magnesia (d) Limestone

2019

23. **Compound obtained when Na burns in excess of air**
(a) NaO_2 (b) Na_2O_2 (c) Na_2O (d) Na_2O_3

24. **Element Cs (Cesium) shows resemblance with:**
(a) Ca (b) Cr (c) both a, b (d) Fr

25. **General name of mineral $MgSO_4.7H_2O$ is?**
(a) Gypsom (b) Dolomite (c) Calcite (d) Epsom salt

26. **Which sulphate is not soluble in water?**
(a) Sodium sulphate (b) Potassium sulphate (c) Zinc sulphate (d) Barium sulphate

27. Formula of Epsom salt is:
(a) $MgSO_4.7H_2O$ (b) $MgSO_4$ (c) $MgCO_3$ (d) $CaMg_3(SiO_3)_4$

28. Which ion will have the maximum value of heat of hydration?
(a) Na^+ (b) Cs^{2+} (c) Ba^{2+} (d) Mg^{2+}

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29. The oxide of Beryllium is
(a) acidic (b) basic (c) amphoteric (d) none of these

30. Which one of the following has the lowest melting point?
(a) Be (b) Mg (c) Ca (d) Sr

31. Which one of the following does not belong to alkaline earth metals?
(a) Be (b) Ra (c) Ba (d) Rn

ANSWERS TO MULTIPLE CHOICE QUESTIONS

1	2	3	4	5	6	7	8	9	10	11	12	13
D	A	C	D	A	A	A	D	A	A	C	C	D
14	15	16	17	18	19	20	21	22	23	24	25	26
D	C	C	A	D	A	C	B	B	B	D	D	D
27	28	29	30	31								
A	D	C	B	D								

CHAPTER No:2 s- BLOCK ELEMENTS
SHORT QUESTIONS
IN ALL PUNJAB BOARD PAPERS 2011-2021

Topic No: 2.1 Introduction, Peculiar behaviour of Li & Be:

1 **Why S-block elements are called as alkali metals and alkaline earth metals?**

Ans: The name alkali came from Arabic, which mean 'The Ashes'. The arab used this term ,for these metals because they found that the ashes of plants were composed chiefly of sodium and potassium. Elements of group IA are called alkali metals, because they produce alkaline solutions with water.
Elements of group IIAare called alkaline earth metals. The alkaline earth metals are beryllium, magnesium, calcium, strontium, barium and radium. They are called alkaline earth metals because they produce alkalies in water and are widely distributed in earth crusts.

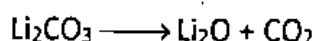
2 **Which elements are called as alkaline earth metals? Why this name is used for these elements?**

Ans: Elements of group IIAare called alkaline earth metals. The alkaline earth metals are beryllium, magnesium, calcium, strontium, barium and radium. They are called alkaline earth metals because they produce alkalies in water and are widely distributed in earth crusts.

3 **Why lithium carbonate decomposes on heating while other ,alkali metal carbonates remain unaffected?**

Ans: Lithium has low electropositive character, thus its carbonate and nitrate are not so stable and therefore decompose giving lithium oxide. Carbonates of other alkali metals do not decompose.

$$Li_2CO_3 \longrightarrow Li_2O + CO_2$$

4 Complete and balance the equations: **(4 times)**

(a) $LiNO_3$+ heat ⇒ **(b)** $Mg(NO_3)_2$+heat⇒

Ans: $2LiNO_3$+ heat ⇒ $2Li_2O + 4NO_2 + O_2$

$Mg(NO_3)_2$+heat⇒$2MgO + 4NO_2 + O_2$

5 Write the formulas of : (a) Beryl (b) Sylvite.

Ans:

Name	Formula
Beryl	$Be_3Al_2(SiO_3)_6$
Sylvite	KCl

6 Why group II –A elements are called Alkaline Earth Metals. **(3 times)**

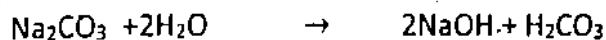
Ans: Group IIA elements are called alkaline earth metals because they produce alkalies in water and are widely distributed in earth's crusts.

7. Give formulas of: (i) Natron (ii) Halite.

Ans: (i) Formula of natron= $Na_2CO_3.H_2O$ (ii) Formula of halite= NaCl

8. Why aqueous solution of Na_2CO_3 is alkaline in nature. **(8 times)**

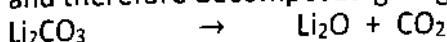
Ans: The solution of Na_2CO_3 in water is alkaline due to hydrolysis of carbonate ion. So it will turn red litmus to blue. It produces an acid and base, but the base is stronger than that of acid. So the aqueous solution of Na_2CO_3 is alkaline in nature

$$Na_2CO_3 + 2H_2O \rightarrow 2NaOH + H_2CO_3$$

9. What happened when (a)Lithium Carbonate is heated (b)Beryllium is treated with sodium Hydroxide. **(3 times)**

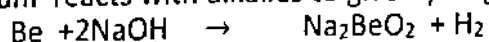
Ans: **Chemical reactions:**

(a)Lithium Carbonate is heated:

Lithium has low electropositive character, thus its carbonate are not so stable and therefore decomposed giving lithium oxide on heating.

$$Li_2CO_3 \rightarrow Li_2O + CO_2$$

(b)Beryllium is treated with sodium Hydroxide:

Beryllium reacts with alkalies to give hydrogen as:

$$Be + 2NaOH \rightarrow Na_2BeO_2 + H_2$$

10. Write a brief note on the occurrence of alkaline earth metals?

Ans: **Occurrence of alkaline earth metals:** Being very reactive, alkaline earth metals also do not occur in free state. The compounds of these metals occur widely in nature.

Magnesium and calcium are very abundant in earth's crust. The outer portion of the earth was originally in the form of silicates and alumino-silicates of alkaline earth metals. Calcium phosphate, and calcium fluoride are also found as minerals. Calcium is an essential constituent of many living organisms. It occurs as skeletal material in bones, teeth, sea shells and egg shells.

Radium is a rare element. It is of great interest because of its radioactive nature.

11. Write Chemical Formulae of (a)Carnallite (b) Borax

Ans: (a). Chemical Formula of Carnallite $KCl.MgCl_2.6H_2O$

(b). Chemical Formula of Borax $Na_2B_4O_7.10H_2O$

12. Give the name and formula for common minerals of Be.

Ans:

Name	Formula
Beryl	$Be_3Al_2(SiO_3)_6$
Chrysoberyl	Al_2BeO_4

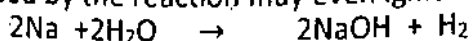
13. Lithium is least reactive element of all alkali metals .Give reasons

Ans: **Lithium is least reactive element of all alkali metals:**

Lithium is least reactive element of all alkali metals because of its small radius and high charge density. The nuclear charge of Li^+ ion is screened only by a shell of two electrons. The so called 'anomalous' properties of lithium are due to the fact that lithium is unexpectedly far less electropositive than other alkali metals.

14. When sodium reacts with water, hydrogen which evolves catches fire, why? **(2 times)**

Ans: A small piece of sodium floated on water reacts vigorously to liberate hydrogen and produce metal hydroxide. The reaction is highly exothermic. The energy produced by the reaction may even ignite the hydrogen.

$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$

15. What happen when beryllium react with sodium hydroxide and lithium hydride reacts with water? (5 times)

Ans: Beryllium reacts with alkalies to give hydrogen as:

$$Be + 2NaOH \rightarrow Na_2BeO_2 + H_2$$

Lithium hydrides are useful sources of hydrogen when treated with water:

$$LiH + H_2O \rightarrow LiOH + H_2$$

water and converted to a white powder $Na_2CO_3.H_2O$

16. Write any two points of difference of Be with its family members.

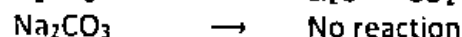
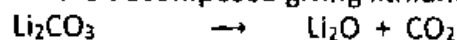
Ans: Beryllium is the lightest member of the series. The main points of difference are:

1. Beryllium metal is almost as hard as iron and hard enough to scratch glass. The other alkaline earth metals are much softer than beryllium but still harder than the alkali metals.
2. The melting and boiling points of beryllium are higher than other alkaline earth metals.

17. What happens when : (i) Li_2CO_3 (ii) Na_2CO_3 is heated

Ans: Lithium has low electropositive character, thus its carbonate are not so stable and therefore decomposed giving lithium oxide on heating.

$$Li_2CO_3 \rightarrow Li_2O + CO_2$$

$$Na_2CO_3 \rightarrow \text{No reaction}$$

18. What is the action of litmus with aqueous solution of Na_2CO_3.

Ans: The solution of Na_2CO_3 in water is basic due to hydrolysis of carbonate ion. So, it will turn red litmus to blue. $Na_2CO_3 + 2H_2O \rightarrow 2NaOH + H_2CO_3$

19. Justify that BeO is an amphoteric oxide, show with two suitable examples (6 times)

Ans: <u>BeO is an amphoteric oxide:</u>

BeO is amphoteric in nature, since it reacts with both acids and bases.

$$BeO + H_2SO_4 \rightarrow BeSO_4 + H_2O$$

$$BeO + 2NaOH \rightarrow Na_2BeO_2 + H_2$$

20 Write points to show peculiar behavior of Berylium.

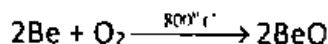
Ans: Peculiar behavior of Berylium:

(i). Beryllium metal is almost as hard as iron and hard enough to scratch glass. The other alkaline earth metals are much softer than beryllium but still harder than the alkali metals.

(ii). Melting and boiling points of beryllium are higher than other alkaline earth metals.

(iii). Beryllium is least reactive metal in the group. It is resistant to complete oxidation and stable in air at ordinary temperature but oxidize rapidly at about 800 °C.

(iv). Beryllium is not tarnished by atmospheric attack but the metal soon loses the silvery appearance.

$$2Be + O_2 \xrightarrow{800^\circ C} 2BeO$$

<u>Topic No: 2.2: General Properties:</u>

21. Alkali and alkaline earth metals are reactive elements of periodic table. Justify it.

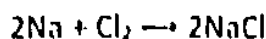
Ans: Alkali and alkaline earth metals are reactive elements of periodic table because, these elements are most electropositive elements. Alkali metals have only one electron in their valence shell. Ionization energy values of alkali metals are very low.

Alkaline earth metals have two electrons in their valence shell. These also have very low ionization values. So both alkali and alkaline earth metals are reactive.

22. Give reason that alkali metals are strong reducing agents? (5 times)

Ans: The reducing property of an element depends on the magnitude of its ionization energy. Reducing agent is a substance which can lose electron. Since alkali metals have got low ionization energies, so they are strong reducing agents.

They are highly electropositive. They react readily with halogens giving alkali metal halides.

$$2Na + Cl_2 \rightarrow 2NaCl$$

23. What is milk of Magnesia and for which treatment it used. (5 times)

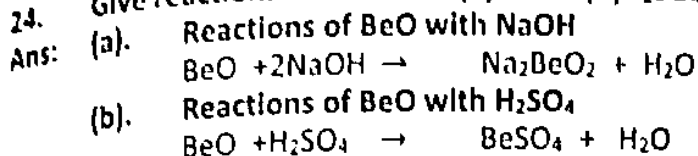
Ans: A suspension of $Mg(OH)_2$ in water is called milk of magnesia and it is used for the treatment of acidity in stomach.

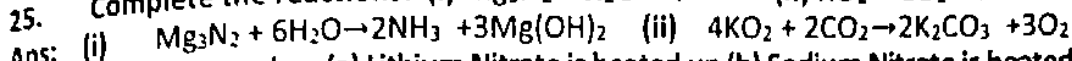
24. Give reactions of BeO with (a)NaOH (b)H_2SO_4.

Ans: (a). **Reactions of BeO with NaOH**

$BeO + 2NaOH \rightarrow Na_2BeO_2 + H_2O$

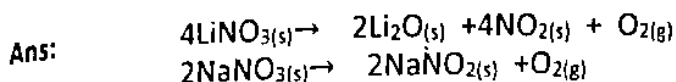
(b). **Reactions of BeO with H_2SO_4**

$BeO + H_2SO_4 \rightarrow BeSO_4 + H_2O$

25. Complete the reactions: (i) $Mg_3N_2 + H_2O \rightarrow ?$ (ii) $KO_2 + CO_2 \rightarrow ?$

Ans: (i) $Mg_3N_2 + 6H_2O \rightarrow 2NH_3 + 3Mg(OH)_2$ (ii) $4KO_2 + 2CO_2 \rightarrow 2K_2CO_3 + 3O_2$

26. What happens when (a) Lithium Nitrate is heated up (b) Sodium Nitrate is heated up. (2 times)

Ans:

$4LiNO_{3(s)} \rightarrow 2Li_2O_{(s)} + 4NO_{2(s)} + O_{2(g)}$

$2NaNO_{3(s)} \rightarrow 2NaNO_{2(s)} + O_{2(g)}$

27. How potassium superoxide KO_2 has very interesting use in breathing equipment for mountaineers and space crafts. (4 times)

Ans: Potassium superoxide KO_2 has very interesting use in breathing equipment for mountaineers space crafts because it has ability to absorb carbon dioxide while giving out oxygen at the same time as: $KO_{2(s)} + 2CO_{2(g)} \rightarrow 2K_2CO_{3(s)} + 3O_{2(g)}$

28. Write the formulae of (1)Natron (2)Dolomite

Ans: <u>**Formulae of (1)Natron (2)Dolomite**</u>

Formula of Natron: $Na_2CO_3.H_2O$

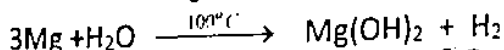
Formula of Dolomite: $MgCO_3.CaCO_3$

29. Give the reactions of Mg metal with (a) N_2 (b) H_2O at 100 °C

Ans: <u>**Reactions of Mg metal:**</u>

$3Mg + N_2 \rightarrow Mg_3N_2$

Magnesium nitride

$3Mg + H_2O \xrightarrow{100^\circ C} Mg(OH)_2 + H_2$

Topic No: 2.3: Manufacture of Sodium:

30. Give advantages of Down's cell. (9 times)

Ans: (i). Metallic fog is not produced.

(ii). Liquid sodium can easily be collected at 600ºC.

(iii). Material of cell is not attacked by the products formed during the electrolysis.

31. Why is $CaCl_2$ added in molten NaCl in Down's cell. (3 times)

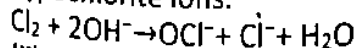
Ans: <u>**$CaCl_2$ added in molten NaCl in Down's cell:**</u>

Sodium chloride is used as raw material in Down's cell. The melting point of sodium chloride is 801ºC. Some calcium chloride is added to lower the melting point of sodium chloride. Calcium chloride permits the furnace to operate at about 600ºC.

Topic No: 2.4: Manufacture of NaOH:

32. Mention two major problems that may arise in Nelson's cell. (4 times)

Ans: (i). Chlorine produced can react with hydroxide ions in cold giving hypochlorite ions.

$Cl_2 + 2OH^- \rightarrow OCl^- + Cl^- + H_2O$

(ii). Hydroxide ions may be attracted toward anode, where they can be discharged releasing oxygen gas. This oxygen gas may contaminate the chlorine and renders it impure.

33. Write the advantages of Nelson's cell.

Ans: (i). By using this method sodium hydroxide is manufactured on large scale.

(ii). Sodium hydroxide is product of this process but some by products are also achieved like hydrogen gas and chlorine gas.

(iii). It is very cheap process because its raw material is sodium chloride (rock salt) which is not costly.

34. How chlorine produced in Diaphragm cell, is protected to react with Hydroxide ions?

Ans: Chlorine produced can react with hydroxide ions. To prevent this problem asbestos diaphragm is used. This keeps the two solutions separate while allowing sodium ions to move towards the cathode. This movement of ions keep the current following through the external current.

Topic No: 2.5: Role of Gypsum in Agriculture and Industry:

35. What is the role of Gypsum in Agriculture. **(3 times)**

Ans: Role of Gypsum in Agriculture:Gypsum is applied to the soil as source of calcium and sulphur. The calcium supplied by gypsum in fertilizer is of importance in crop production in area where soils are subject to extensive leaching.

Sulphur compounds had been applied to soils because of their observed beneficial effect on plants, sulphur has an influence on chlorophyll development in plant leaves. Although not a constituent of chlorophyll, plants deficient in sulphur exhibits a pale green colour. The root system of several plants have been observed to be greatly enlarged by the application of sulphur containing materials such as gypsum.

36. What are main uses of Plaster of Paris. **(2 times)**

Ans: (1). Plaster of Paris is used for making plaster walls, casts of statuary, coins, etc.

(2). It is used in surgery, Plaster of Paris bandages are used for holding in place fractured bones after they have been set.

(3). It is also used in cement Plaster in which usually glue or other oils have been added as retarders to prolong the time of setting.

37. 2% gypsum is added in the cement.Justify. **(6 times)**

Ans: 2% gypsum is added in the cement which prevents the cement from hardening too rapidly. The addition of gypsum increases the setting time of cement.

38. What is cement plaster and Hard finish plaster. **(2 times)**

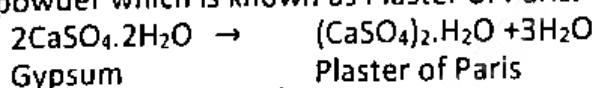
Ans: **Cement plaster :**It is Plaster of Paris to which usually glue or other oils have been added as retarders to prolong the time of setting.

Hard finish plasters: These are made by the calcination of anhydrous sulphate with alum or borax. These plasters are set very slowly but give a hard finish.

39. How Gypsum is converted into Plaster of Paris ? **(5 times)**

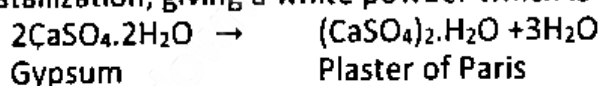
Ans: When gypsum is heated under carefully controlled conditions, It loses three quarters of its water of crystallization, the resulting product is called Plaster of Paris. Calcium sulphate occurs in nature as gypsum $CaSO_4.2H_2O$. When it is heated above 100ºC, it loses three quarters of its water of crystallization, giving a white powder which is known as Plaster of Paris.

$$2CaSO_4.2H_2O \rightarrow (CaSO_4)_2.H_2O + 3H_2O$$

Gypsum Plaster of Paris

40. How Plaster of Paris is formed .Give its two uses? / What is the effect of heat on $CaSO_4.2H_2O$?

Ans: Formation of Plaster of Paris:When gypsum is heated under carefully controlled conditions, It loses three quarters of its water of crystallization, the resulting product is called Plaster of Paris. Calcium sulphate occurs in nature as gypsum $CaSO_4.2H_2O$. When it is heated above 100ºC, it loses three quarters of its water of crystallization, giving a white powder which is known as Plaster of Paris.

$$2CaSO_4.2H_2O \rightarrow (CaSO_4)_2.H_2O + 3H_2O$$

Gypsum Plaster of Paris

Uses of Plaster of Paris

(i). Plaster of Paris is used for making plaster walls, casts of statuary, coins, etc.

(ii). It is used in surgery, Plaster of Paris bandages are used for holding in place fractured bones after they have been set.

(iii). It is also used in cement Plaster in which usually glue or other oils have been added as retarders to prolong the time of setting.

41. How Portland cement is made? Why Gypsum Is added in the cement?

Ans: Portland cement: Portland cement is made by strongly heating a finely powdered mixture of clay and limestone. The final product is known as clinker which is cooled and then ground into a very fine powder.

Addition of gypsum: During the grinding there is added about 2% of gypsum which prevents the cement from hardening too rapidly. The addition of gypsum increases the setting time of cement.

Topic No: 2.6: Role of lime in Agriculture and industry:

42. What is the function of calcium in plant growth. (4 times)

Ans: Function of calcium in plant growth:

(i) The presence of calcium is essential for the normal development of plants. The quantity of calcium required by different plants varies considerably. An adequate supply of calcium appears to stimulate the development of roots hairs and, infact, the entire root system.

(ii) Calcium is also necessary for the normal leave development and tends to accumulate in leaves as well as in bark, an adequate supply of calcium is also essential for the optimum activity of microorganisms that produce nitrates.

(iii) The effect of calcium on the supply of available phosphorus in the soil is of special significance. Soils containing sufficient calcium are slightly alkaline in nature.

43. Why lime is added to acidic soil. (5 times)

Ans: Addition of lime to acidic soil: Large quantities of calcium oxide are used in agriculture for neutralizing acidic soils. It has been found that application of lime to acidic soils increases the amount of readily soluble phosphorus.

Calcium oxide is also used in large amounts for making lime-sulphur sprays which have as strong fungicidal action. The hydroxide of calcium is obtained when the oxide of the calcium is allowed to react with water. The process is called slaking of lime and it is an exothermic reaction. $CaO + H_2O \rightarrow Ca(OH)_2$

44. Give two uses of Lime in industry. (2 times)

Ans: (i). Large quantities of lime are used in the extraction and refining of metals.

(ii). Lime is used in paper, cement and leather industries.

45. Why lime water turns milky with CO_2 but becomes clear with excess CO_2? (11 times)

Ans: A saturated solution of $Ca(OH)_2$ is called lime water and is used as a test for CO_2. When lime water reacts with CO_2 it turns to $CaCO_3$ (lime stone) which is a solid product. Thus lime water turns milky due to the presence insoluble suspension of calcium carbonate, as shown by following reaction.

$$Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow CaCO_{3(s)} + H_2O_{(l)}$$

But if excess CO_2 is added, the following reaction takes place:

$$CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \rightarrow Ca(HCO_3)_{2(aq)}$$

The milkiness disappears since calcium bicarbonate is water-soluble.

46. Why Calcium is essential for the normal growth of plants.?

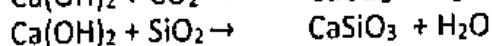
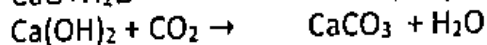
Ans: Use of Calcium in normal growth of plants: The presence of calcium is essential for the normal development of plants. The quantity of calcium required by different plants varies considerably. An adequate supply of calcium appears to stimulate the development of roots hairs and, infect, the entire root system. Calcium is also necessary for the normal leave development and tends to accumulate in leaves as well as in bark, an adequate supply of calcium is also essential for the optimum activity of microorganisms that produce nitrates. The effect of calcium on supply of available phosphorus in the soil is of special significance. Soils containing sufficient calcium are slightly alkaline in nature.

47. What is a lime mortar and what changes occur when it hardens during hydrolysis.

Ans: **Lime mortar:** Ordinary mortar, also called lime mortar, is prepared by mixing freshly prepared slaked lime (one volume) with sand (three or four volumes) and water to form a thick paste. This material when placed between the stones and bricks hardens or sets, thus binding the blocks firmly together. The equations of the chemical reactions which take place when mortar hardens are:

$CaO+H_2O \rightarrow Ca(OH)_2$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

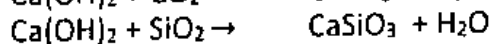
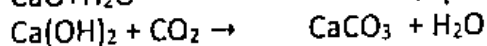
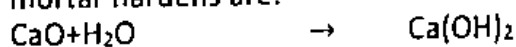
$Ca(OH)_2 + SiO_2 \rightarrow CaSiO_3 + H_2O$

48 How lime mortar is prepared.Explain with chemical equation. (3 times)

Ans: **Preparation of Lime mortar** Ordinary mortar, also called lime mortar, is prepared by mixing freshly prepared slaked lime (one volume) with sand (three or four volumes) and water to form a thick paste. This material when placed between the stones and bricks hardens or sets, thus binding the blocks firmly together.

Chemical equations: Equations of the chemical reactions which take place when mortar hardens are:

$CaO+H_2O \rightarrow Ca(OH)_2$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

$Ca(OH)_2 + SiO_2 \rightarrow CaSiO_3 + H_2O$

49. What happens when CaC_2 is Hydrolyzed.

Ans: CaC_2 on hydrolysis yields acetylene (C_2H_2). $CaC_2+2H_2O \rightarrow C_2H_2+Ca(OH)_2$

2019

50. Differentiate between alkali and alkaline earth metals. Give one example in each case.

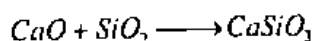
Ans: **Alkali metals:** Elements of group IA except Hydrogen are called Alkali metals. e.g; Li, Na, K, Rb, Cs, Fr

Alkaline earth metals: Elements of group II A are called alkaline earth metals. e.g; Be, Mg, Ca, Sr, Ba and Ra.

51. How are lime and sand used to make glass.

Ans: When lime and sand react at high temperature in furnace, $CaSiO_3$ (Calcium silicate) is formed.

$CaSiO_3$ serves as important basis for glass manufacture.

$$CaO + SiO_2 \longrightarrow CaSiO_3$$

52. What is chemical nature of lime water and milk of magnesia?

Ans: **Lime water:** A saturated aqueous solution of $Ca(OH)_2$ is called lime water.

Milk of Magnesia: A aqueous suspension of magnesium hydroxide $Mg(OH)_2$ is called Milk of Magnesia.

53. It is easier to decompose Li_2CO_3 thand K_2CO_3. Justify.

Ans:

$$Li_2CO_3 \longrightarrow Li_2O + CO_2$$

Li_2CO_3 is easily decomposed because gain in electrostatic force of attraction in converting carbonate to oxide is considerable.

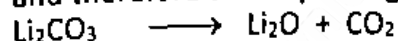
Due to large cation like K^+ ion K_2CO_3 is more stable and not easily decomposed.

2021

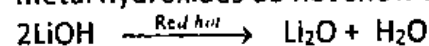
54. What happens when (a) Lithium carbonate is heated (b) Lithium hydroxide is heated to red hot?

Ans: **(a) Lithium carbonate is heated:**

Lithium has low electropositive character, thus its carbonate are not so stable and therefore decomposed giving lithium oxide on heating.

$Li_2CO_3 \longrightarrow Li_2O + CO_2$

(II) Lithium hydroxide is heated to red hot.

Lithium hydroxide when strongly heated, forms lithium oxide but the other alkali metal hydroxides do not show this behaviour.

$2LiOH \xrightarrow{\text{Red hot}} Li_2O + H_2O$

55. Write down electronic configuration of Na and Ca.

Ans: Electronic configuration of Na = $[Ne]3s^1$

Electronic configuration of Ca = $[Ar]4s^2$

56. Why the group I-A elements are called alkali metals?

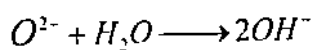
Ans: The name alkali came from Arabic, which mean 'The Ashes'. The arab used this term for these metals because they found that the ashes of plants were composed chiefly of sodium and potassium. Elements of group IA are called alkali metals, because they produce alkaline solutions with water.

57. Why the elements of group IIA are called alkaline earth metals?

Ans: Elements of group IIA are called alkaline earth metals. The alkaline earth metals are beryllium, magnesium, calcium, strontium, barium and radium. They are called alkaline earth metals because they produce alkalies in water and are widely distributed in earth crusts.

58. The reaction of alkali metal oxide with water is an acid-base reaction and not an oxidation reduction reaction, why?

Ans: The reaction of an alkali metal oxide with water is an acid-base reaction and not an oxidation reduction reaction since no element undergoes a change in its oxidation number. The reaction simply involves the decomposition of water molecule by an oxide ion.

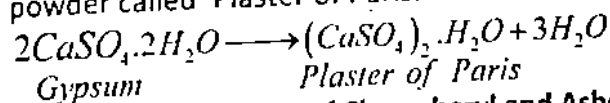
$$O^{2-} + H_2O \longrightarrow 2OH^-$$

59. Give chemical formula of Carnallite and Barite.

Ans: **Carnallite:** $KCl.MgCl_2.6H_2O$

Barite: $BaSO_4$

60. What is Plaster of Paris?

Ans: Calcium sulphate occurs in nature as gypsum $CaSO_4.2H_2O$. When it is heated above 100°C, it loses three quarters of its water of crystallization, giving a white powder called' Plaster of Paris.

$$\underset{Gypsum}{2CaSO_4.2H_2O} \longrightarrow \underset{Plaster\ of\ Paris}{(CaSO_4)_2.H_2O} + 3H_2O$$

61. Give chemical formula of Chrysoberyl and Asbestos.

Ans: **Chrysoberyl:** Al_2BeO_4

Asbestos: $CaMg_3(SiO_3)_4$

62. Write the Chemical Formulae of: (a) Calcite (b) Barite

Ans: **(a) Calcite :** $CaCO_3$

(b) Barite : $BaSO_4$

63. Write down chemical composition of: (a) Dolomite (b) Gypsum.

Ans: **(a) Dolomite :** $MgCO_3.CaCO_3$

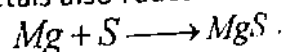
(b) Gypsum: $CaSO_4.2H_2O$

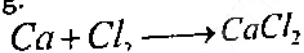
64. What do you know about S-block Elements ? Give two examples.

Ans: The s-block elements are the metals in Group IA and Group IIA of the periodic table.They are called the s-block elements because s-orbitals are being filled, in their outer most shells.The elements of group IA except hydrogen are called "Alkali metals" while those of IIA are named "Alkaline-earth metals".

65. Give two properties of Alkaline Earth metals.

Ans: (i) With sulphur, magnesium gives magnesium sulphide, MgS. The other Group II-A metals also react similarly.

$$Mg + S \longrightarrow MgS$$

(ii) All group II-A elements react directly with halogens giving halides of the type MX2 e.g.

$$Ca + Cl_2 \longrightarrow CaCl_2$$

66. Give chemical formulas of Sylvite and Spodumene.

Ans: **Sylvite :** KCl

Spodumene.: $LiAl(SiO_3)_2$

Chapter No:2 s- BLOCK ELEMENTS
LONG QUESTIONS
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 2.1:

1. Show four chemical reactions in which Li behaves different from elements of its own group. (7 times)

Ans: (Text Book Page No:23)

2. Compare the chemical behavior of lithium with magnesium. (4 times)

Ans: (Text Book Page No:28)

3. Discuss peculiar behavior of Beryllium with respect to other member of II-A group. (10 times)

Ans: (Text Book Page No:24)

Topic No: 2.2

4. Complete and balancing the following equations:

$KO_2 + CO_2 \longrightarrow$ ii) $Mg_3N_2 + H_2O \longrightarrow$

$Na_2O_2 + H_2O \longrightarrow$ iv) $BeO + NaOH \longrightarrow$

Ans: (Text Book Page No:27+28)

5. Give the reaction of sodium with oxygen.

Ans: (Text Book Page No:25)

6. Give reaction of Mg with N_2 followed by its hydrolysis.

Ans: (Text Book Page No:26)

7. Write the reaction of potassium with (i) hydrogen sulphide (ii) ferrous sulphate (iii) oxalic acid (d) potassium hydroxide

Ans: (Text Book Page Chap 2)

Topic No: 2.3

8. Describe the commercial preparation of sodium by Down's cell. What are advantages of this process? (21 times)

Ans: (Text Book Page No:29)

9. Explain the construction of Down's cell. Give reactions taking place at cathode and anode.

Ans: (Text Book Page No:29+30)

Topic No: 2.4

10. Describe preparation of sodium hydroxide by Nelson's Diaphragm cell. (10 times)

Ans: (Text Book Page No:30)

Topic No: 2.5

11. Discuss the role of gypsum in industry. (4 times)

Ans: (Text Book Page No:31)

12. Write the role of Gypsum in Agriculture. (3 times)

Ans: (Text Book Page No:31)

Topic No: 2.6

13. Describe eight points to discuss role of lime in industries. (6 times)

Ans: (Text Book Page No:33)

14. Give four application of lime in agriculture and four applications in industry.

Ans: (Text Book Page No:32)

2021

15. Give the formula of Sylvite, Borax, Trona, Natron, Dolomite, Alunite, Asbestos and Barite.

16. Describe occurrence of alkali metals and alkaline earth metals in nature.

CHAPTER NO:3
GROUP IIIA AND GROUP IVA ELEMENTS
OBJECTIVES (MCQ'S)
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 3.1: Group IIIA Elements:

1. Which elements forms an ion with charge +3? **(4 times)**
(a) Be (b) Al (c) C (d) Si

2. Elements having less than four electrons in its valence shell but it is not a metal:
(a) B (b) Al (c) Ga (d) In

3. Valence shell electronic configuration of the elements of group III-A is:
(a) ns^1, np^2 (b) ns^2, np^3 (c) ns°, np^3 (d) ns^2, np^1

4- Which element forms an ion with charge 3+ **(6 times).**
(a) Be (b) Al (c) Si (d) C

5- Which of the following is non-metal?
(a) B (b) Al (c) Ga (d) In

6-Which of the following element is not present abundantly in earth's crust: **(6 times)**
(A) Silicon (B) Aluminium (C) Sodium (D) Oxygen

7- Borax has the chemical formula:
(A) KNO_3 (B) $NaNO_3$ (C) $Na_2B_4O_7.10H_2O$ (D) $Na_2CO_3.H_2O$

8- Chemical Composition of Colemanite is: **(3 times)**
(A) $Ca_2B_6O_{11}.5H_2O$ (B) $CaB_4O_7.4H_2O$ (C) $CaNaB_5O_9.8H_2O$ (D) $Na_2B_4O_7.4H_2O$

Topic No: 3.1.1: Occurrence (Boron and Aluminium):

9. Tincal is a mineral of: **(12 times)**
(a) Al (b) Boron (c) Silicon (d) Carbon

10. Kaolin is mineral of:
(a) Aluminium (b) Magnesium (c) Calcium (d) Barium

11. The chief ore of aluminium(Al) is: **(9 times)**
(a) Na_3AlF_6 (b) $Al_2O_3.2H_2O$ (c) Al_2O_3 (d) $Al_2O_3.H_2O$

12. Bauxite is a mineral of: **(2 times)**
(a) B (b) Be (c) Mg (d) Al

Topic No: 3.2.1: Compounds of Boron:

13. The aquous solution of borax is: **(2 times)**
(a) Acidic (b) Basic (c) Neutral (d) Corrosive

14. Boric acid can not be used: **(6 times)**
(a) An antiseptic in medicine (b) For washing eyes
(c) In soda bottles (d) For enamels and glazes

15. In Borax bead test, colour of cupric borates are:
(a) Blue (b) Red (c) Green (d) Colourless

Topic No: 3.3: Reactions of Aluminium:

16. Which metal is used in the thermite process because of its activity? **(11 times)**
(a) Iron (b) Copper (c) Aluminium (d) Zinc

17. Which metal is used in the flash light photography because of its activity?
(a) Iron (b) Copper (c) Aluminium (d) Zinc

Topic No: 3.4: Group IVA Elements:

18- Which element among the following belongs to group IVA of periodic table? **(3 times)**
(a) Barium (b) Iodine (c) Tin (d) Oxygen

Topic No: 3.5: Compounds of Carbon and Silicon:

19. Ordinary glass is:
(a) Potassium silicate (b) Calcium silicate
(c) Sodium silicate (d) Calcium and Sodium silicate

20. Following is used in making fire proof clothes:
(a) Water glass (b) Borax glass (c) Kaolin (d) Asbestos

21. If temperature dropped from 100 °C to 0°C , the viscosity of petroleum oil may:

(a) Increase four times (b) Decrease four times
(c) Increase 100 times (d) Decrease 100 times

Topic No: 3.7

22. The stable yellow modification of Lead chromate is:

(a) Triclinic (b) Hexagonal (c) Tetragonal (d) Monoclinic

23. Chemical formula of litharge is?

(a) Pb_2O (b) SiO_3 (c) PbO (d) Pb_3O_4

2021

24. Which element belongs to group IVA of the periodic table?

(a) barium (b) iodine (c) lead (d) oxygen

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12
B	A	D	B	A	C	C	A	B	A	B	D
13	14	15	16	17	18	19	20	21	22	23	24
B	C	A	C	C	C	D	D	C	D	C	C

CHAPTER NO:3 SHORT QUESTION'S OF CHAPTER-3 GROUP IIIA AND GROUP IVA ELEMENTS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 3.1: Group IIIA Elements, Occurrence of Boron and Aluminium:

1. Write formulas of Borax and Chile Saltpeter. **(2 times)**

Ans: Formula of Borax : $Na_2B_4O_7.10H_2O$
Formulae of Chile Saltpeter : $NaNO_3$

2 Write down formulas for Tincal and Orthoboric acid?

8Ans: Formula for Tincal : $Na_2B_4O_7.10H_2O$
Formula for orthoboric acid : H_3BO_3

3 Give formulas of following : (a)Tincal (b) Mica

Ans: (a). Formulas of Tincal : $Na_2B_4O_7.10H_2O$
(b). Formula of Mica : $KH_2Al_3(SiO_4)_3$

4. Write formulas of : (i) Colemanite (ii) Cryolite

Ans: Formulas of Colemanite = $Ca_2B_6O_{11}.5H_2O$
Formulas of Cryolite = Na_3AlF_6

5. Write the formula of (a) Bauxite (b) Cryolite

Ans: Formulae
(a) Bauxite = $Al_2O_3.2H_2O$ (b) Cryolite = Na_3AlF_6

Topic No: 3.1.2: Peculiar Behaviour of Boron:

6. Write any two properties of boron which show peculiar behavior? (2 Times)

Ans: (i). Boron is only element in Group IIIA which is non-metallic in behaviour.
(ii). It is the only element with less than four electrons in the outermost shell which is not a metal

7. Boron differs from its family members .discuss?

Ans: Boron differs from its family members:

(i). Boron is only element in Group IIIA which is non-metallic in behaviour.
(ii). It is the only element with less than four electrons in the outermost shell which is not a metal
(iii). One of the outstanding features of the chemistry of boron is its ability to form molecular addition compounds.
(iv). Boron does not form ionic compounds with sulphate, nitrate or other anions because boron does not form a stable cation.

Topic No: 3.2.1: Borax:

8. What happens when borax is heated with NH_4Cl? **(2 Times)**

Ans: **Reaction of borax with NH_4Cl:** When borax Is heated with ammonium chloride, boron nitride is produced. $Na_2B_4O_7 + 2NH_4Cl \rightarrow 2NaCl + 2BN + B_2O_3 + 4H_2O$

9. What happens when borax is treated with HCl and H_2SO_4 separately?

Ans: Aqueous solution of borax reacts with HCl or H_2SO_4 to form boric acid.

$$Na_2B_4O_7 + 2HCl + 5H_2O \rightarrow 4H_3BO_3 + 2NaCl$$

$$Na_2B_4O_7 + H_2SO_4 + 5H_2O \rightarrow 4H_3BO_3 + Na_2SO_4$$

10. Aqueous solution of borax is alkaline in nature. Justify the statement. (4 times)

Ans: Aqueous solution is alkaline in nature due to hydrolysis.

$$Na_2B_4O_7 + 7H_2O \rightarrow 2NaOH + 4H_3BO_3$$

Borax — Strong alkali — Weak acid

11 Give equations represent the following reactions; (2 times)

(i). Borax is heated with CoO(Cobalt oxide) (ii). Al_2O_3 is heated with NaOH

Ans: **(i). Borax is heated with CoO(Cobalt oxide)**

Borax, when fused, is decomposed into sodium metaborate and boric anhydride.

$Na_2B_4O_7 \rightarrow 2NaBO_2 + B_2O_3$

The metallic oxide formed from the substance, under examination, combines with B_2O_3 giving the coloured metallic borates. With cobalt oxide, the beads are coloured in the oxidizing flame because cobalt borates are in colour.

$$CoO + B_2O_3 \rightarrow Co(BO_2)_2$$

(ii). Al_2O_3 is heated NaOH

$$Al_2O_3 + NaOH \rightarrow NaAl(OH)_{4(aq)}$$

12 Write any four uses of borax? (10 times)

Ans:
(i). It is used to prepare borate glass, which is heat resistant.
(ii). It is used in softening of water.
(iii). It is used in metallurgical operations.
(iv). It is used as a flux in welding and in metallurgy.
(v). It is employed in making washing powder.

13 What is the action of an aqueous solution of Borax on litmus. (9 times)

Ans: Aqueous solution of borax is alkaline in nature due to hydrolysis. It will turn red litmus to blue.

$$Na_2B_4O_7 + 7H_2O \rightarrow 2NaOH + 4H_3BO_3$$

Borax — Strong alkali — Weak acid

14 Justify that solubility of borax changes with change in temperature.

Ans: It is sparingly soluble in cold water but is more soluble in hot water: 100 grams of water dissolve 3 grams of decahydrate at 10 °C and 99.3 grams at 100 °C.

15. How borax is uses as water softening agent? (2 times)

Ans: Use of Borax:

Hardness of water is because of Ca^{+2} and Mg^{+2} ions. Borax can remove Ca^{+2} and Mg^{+2} ions from water as calcium tetraborate and magnesium tetraborate.

$$Ca^{+2} + Na_2B_4O_7 \rightarrow CaB_4O_7 + 2Na^+$$

$$Mg^{+2} + Na_2B_4O_7 \rightarrow MgB_4O_7 + 2Na^+$$

Topic No: 3.2.2: Boric Acids:

16 What is reaction of heat on orthoboricacid, H_3BO_3? (6 times)

Ans: When orthoboric acid is heated strongly, it swells to frothy mass losing water molecules. It is first converted into metaboric acid then to tetra boric acid and finally to boric anhydride.

$$H_3BO_3 \xrightarrow{100^\circ C} HBO_2 + H_2O$$

$$HBO_2 \xrightarrow{140^\circ C} H_2B_4O_7 + H_2O$$

$$H_2B_4O_7 \xrightarrow{Red\ Hot} 2B_2O_3 + H_2O$$

17 How is borax converted into boric acid and vice versa? (3 Times)

Ans: A hot concentrated solution of borax is treated with a calculated quantity of concentrated H_2SO_4. On cooling, crystals of boric acid formed separated out.

$$Na_2B_4O_7 + H_2SO_4 + 5H_2O \rightarrow Na_2SO_4 + 4H_3BO_3$$

Borax — Boric acid

18 Show that H_3BO_3 is monobasic acid? **(2 times)**

Ans: H_3BO_3 is a very weak acid and ionizes to a very limited extent mainly as a monobasic acid.

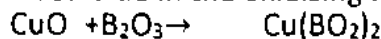
$H_3BO_3 + H_2O \rightarrow [B(OH)_4]^- + H^+$

19 Discuss chemistry of borax bead test? **(11 times)**

Ans: Borax, when fused, is decomposed into sodium metaborate and boric anhydride.

$Na_2B_4O_7 \rightarrow 2NaBO_2 + B_2O_3$

The metallic oxide formed from the substance, under examination, combines with B_2O_3 giving the coloured metallic borates. With cupric oxide, the beads are coloured blue in the oxidizing flame because cupric borates are blue in colour.

$CuO + B_2O_3 \rightarrow Cu(BO_2)_2$

20 Boric acid can be converted to borax and vice versa. Give reactions? **(4 times)**

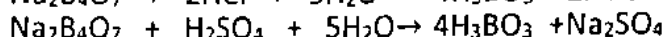
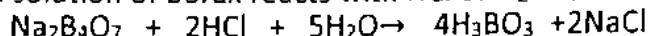
Ans: **Conversion of boric acid into borax:** Borax is prepared by treating a hot solution of boric acid with proper amount of soda ash:.

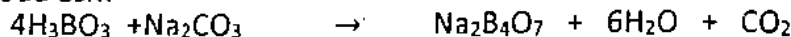
$4H_3BO_3 + Na_2CO_3 \rightarrow Na_2B_4O_7 + 6H_2O + CO_2$

Conversion of borax into boric acid:

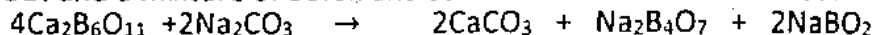
Aqueous solution of borax reacts with HCl or H_2SO_4 to form boric acid.

$Na_2B_4O_7 + 2HCl + 5H_2O \rightarrow 4H_3BO_3 + 2NaCl$

$Na_2B_4O_7 + H_2SO_4 + 5H_2O \rightarrow 4H_3BO_3 + Na_2SO_4$

21 How borax is commercially prepared? Give two methods of preparation.

Ans: (i). Borax is prepared by treating a hot solution of boric acid with proper amount of soda ash:

$4H_3BO_3 + Na_2CO_3 \rightarrow Na_2B_4O_7 + 6H_2O + CO_2$

(ii). Borax is almost exclusively obtained from calcium borate. Finely powderedcolemanite is boiled with Na_2CO_3 solution. When $CaCO_3$ precipitates out and a mixture of borax and sodium metaborate is formed.

$4Ca_2B_6O_{11} + 2Na_2CO_3 \rightarrow 2CaCO_3 + Na_2B_4O_7 + 2NaBO_2$

22 Write the names and chemical formulas of four boric acids? **(24 times)**

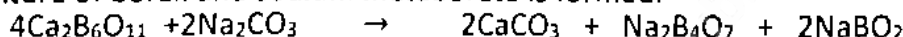
Ans:

	Names	Formulae
(i).	Orthoboric acid	H_3BO_3
(ii).	Metaboric acid	HBO_2
(iii).	Tetraboric acid	$H_2B_4O_7$
(iv).	Pyroboric acid	$H_6B_4O_9$

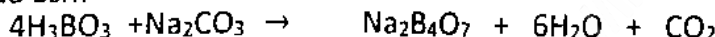
23 How will you prepare Borax from "Colemanite" and "Boric acid"? **(7 times)**

Ans: **Preparation of Borax from "colemanite":**

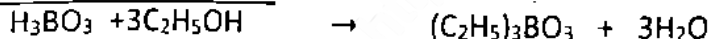
Borax is almost exclusively obtained from calcium borate. Finely powdered colemanite is boiled with Na_2CO_3 solution. When $CaCO_3$ precipitates out and a mixture of borax and sodium metaborate is formed.

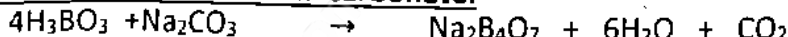
$4Ca_2B_6O_{11} + 2Na_2CO_3 \rightarrow 2CaCO_3 + Na_2B_4O_7 + 2NaBO_2$

Preparation of Borax from "Boric acid":

Borax is prepared by treating a hot solution of boric acid with proper amount of soda ash:

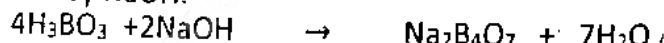
$4H_3BO_3 + Na_2CO_3 \rightarrow Na_2B_4O_7 + 6H_2O + CO_2$

24 How does orthoboric reacts with; (i)Ethanol (ii)Sodium carbonate? **(5 times)**

Ans: **Orthoboric reacts with Ethanol:**

$H_3BO_3 + 3C_2H_5OH \rightarrow (C_2H_5)_3BO_3 + 3H_2O$

Orthoboric reacts with Sodium carbonate:

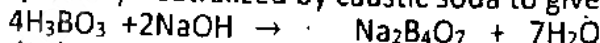
$4H_3BO_3 + Na_2CO_3 \rightarrow Na_2B_4O_7 + 6H_2O + CO_2$

25 Why Boric acid cannot be titrated by NaOH? **(2 Times)**

Ans: Boric acid is partially neutralized by caustic soda to give borax so, boric acid cannot be titrated by NaOH.

$4H_3BO_3 + 2NaOH \rightarrow Na_2B_4O_7 + 7H_2O$

26. How does H_3BO_3act as an acid?

Ans: (i). Boric acid turns blue litmus red.

(ii). Boric acid partially neutralized by caustic soda to give borax.

$4H_3BO_3 + 2NaOH \rightarrow Na_2B_4O_7 + 7H_2O$

27 Write down two (02) uses of boric acid. **(9 times)**

Ans: (i).Boric acid are used in medicines as an antiseptic, e.g. dusting powder, boric ointment and boric solution is used as an eye wash.

(ii). It is used in pottery as a glaze because borate glazes are more fusible than silicate glazes and possess a higher coefficient of thermal expansion.

Topic No: 3.3.1: Aluminium:

28 Aluminium is not found free in nature.Comment the statement?

Ans: It occurs primarily as alumino-silicate minirals found in the rocks of the outer portion of the earth. Aluminium is reactive metal. So, therefore Aluminium is not found free in nature.

29 Write the behavior of Al with conc.HNO_3? (3 times)

Ans: Aluminium does not react with nitric acid at any concentration, probably because of the formation of protective layer of aluminium oxide.

30 Aluminium sheets are said to be corrosion free. Comment. (2 times)

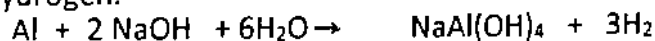
Ans: When a sheet of aluminium is exposed to moist air it acquires a thin, continuous coating of alminium oxide, which prevents further attack on the metal by atmospheric oxygen and water under normal conditions. Because of this aluminium sheets are said to be corrosion-free.

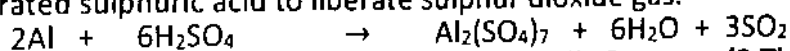
31 Under what conditions aluminium corrodes? (2 times)

Ans: When aluminium sheet is exposed to moist air it acquires a thin, continuous coating of aluminium oxide, which is product of aluminium corrosion.

32 How does Aluminium react with (a) NaOH (b) H_2SO_4

Ans: Alluminiumis dissolved in sodium hydroxide to give solube aluminate, with the evolution of hydrogen.

$$Al + 2NaOH + 6H_2O \rightarrow NaAl(OH)_4 + 3H_2$$

Alluminium does not react with dilute sulphuric acid. However, it is oxidized by hot concentrated sulphuric acid to liberate sulphur dioxide gas.

$$2Al + 6H_2SO_4 \rightarrow Al_2(SO_4)_7 + 6H_2O + 3SO_2$$

33 How Al finds its uses in metallurgy and photoflash bulbs? (2 Times)

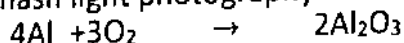
Ans: **Uses of Al in metallurgy:**

Because of its ability to combine with both oxygen and nitrogen, the metal is often used to remove air bubbles from molten metals.

Uses of Al in photoflash bulbs:

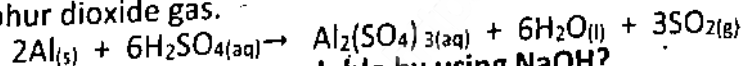
Aluminium sheets are said to be corrosion-free. However, if the aluminum powder is heated to 800ºC and above, the metal will react with air to form aluminium oxide, and aluminium nitride, the reaction is accompanied by the evolution of heat and intense white light. This property of aliuminiumis made use in flash light photography.

$$4Al + 3O_2 \rightarrow 2Al_2O_3$$

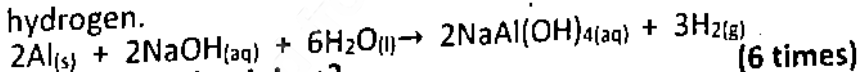
$$2Al + N_2 \rightarrow 2AlN$$

34 Give reactions of Aluminium with dilute and concentrated H_2SO_4? (3 times)

Ans: **Reactions with dilute H_2SO_4:** Aluminium does not react with dilute sulphuric acid.

Reactions with Conc. H_2SO_4: Al is oxidized by hot concentrated sulphuric acid to liberate sulphur dioxide gas.

$$2Al_{(s)} + 6H_2SO_{4(aq)} \rightarrow Al_2(SO_4)_{3(aq)} + 6H_2O_{(l)} + 3SO_{2(g)}$$

35 In which way Al becomes water soluble by using NaOH?

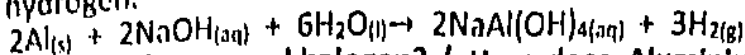
Ans: Aluminium dissolves in sodium hydroxide to form a soluble aluminate, with the evolution of hydrogen.

$$2Al_{(s)} + 2NaOH_{(aq)} + 6H_2O_{(l)} \rightarrow 2NaAl(OH)_{4(aq)} + 3H_{2(g)}$$

36 Outline any four uses of aluminium? (6 times)

Ans:
(i). It is non-magnetic and is thus used in navigational equipment.
(ii). It is non toxic and can be used for making food and brewing equipments and in packaging.
(iii). Aluminium readily forms alloys with other metals like copper, magnesium, nickel and zinc.
(iv). At home, aluminium is found in the form of cooking utensils, window frames and kitchen foil.

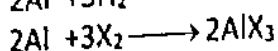
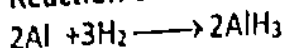
37 How Aluminium reacts with aqueous sodium hydroxide?

Ans: Aluminium dissolves in sodium hydroxide to form a soluble aluminate, with the evolution of hydrogen.

$$2Al_{(s)} + 2NaOH_{(aq)} + 6H_2O_{(l)} \rightarrow 2NaAl(OH)_{4(aq)} + 3H_{2(g)}$$

38 How Al reacts with Hydrogen and halogen? / How does Aluminium react with non-metals? Give any two reactions. (3 Times)

Ans: **Reaction of Aluminum:**

$2Al + 3H_2 \longrightarrow 2AlH_3$

$2Al + 3X_2 \longrightarrow 2AlX_3$

Topic No: 3.4: Group IVA Elements (Carbon and Silicon):

39 Write two points to show peculiar behavior of carbon. (5 Times)

Ans: Carbon differs from remaining members of group IV-A in the following respects;

(i). Carbon and silicon are nonmetals while the other members of the family are metalloids or metals.

(ii). Catenation or self linkage property of carbon to form long chain of identical atoms.

40 Give four common properties of group IVA elements of periodic table. (2 Times)

Ans: (i).All the elements of this group show a valency of four.

(ii). All of them form hydrides, MH_4.

(iii). They form tetrachlorides, MCl_4.

(iv). They also form the oxides, MO_2.

41 Give two similarities between carbon and silicon. (3 times)

Ans: **(i)** Carbon and silicon both form acidic oxides whereas other oxides are amphoteric in nature.

Both carbon and silicon form covalent bonds. Their oxides are acidic and both form hydrides and chlorides.

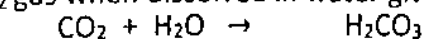
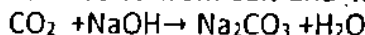
42 In what respects, carbon behaves differently from other members of group IV-A?

Ans: Carbon differs from the remaining members of Group IVA in following respects;

Carbon and silicon are non-metals while the other members of the family are metalloids or metals.

Catenation or self -linkage of identical atoms with each other is called catenation or self-linkage. The property of catenation decreases on moving down the group from carbon to lead. The maximum tendency of catenation associated with carbon forms the basis of the carbon compounds which constitute organic chemistry.

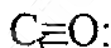
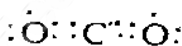
43 Discuss that CO_2 is acidic in character. (3 times)

Ans: CO_2 gas when dissolved in water gives H_2CO_3 an acid. The reaction is given below as: $CO_2 + H_2O \rightarrow H_2CO_3$

CO_2 gas react with a base to from salt and water, shows that it is acidic in nature as: $CO_2 + NaOH \rightarrow Na_2CO_3 + H_2O$

44 Write the structure of carbon mono oxide?

Ans: Carbon monoxide is diatomic molecule having triple bond between the two atoms. It is very slightly polar. The electronic structure of carbon monoxide can be represented as $\left[\overset{\delta+}{C}\equiv\overset{\delta-}{O}\right]$

45 Write down the structure of CO and CO_2.

Ans:

Carbon monoxide: $C\equiv O:$

Carbon dioxide: $:\ddot{O}::C::\ddot{O}:$

46 CO_2 is a gas while SiO_2 is solid at room temperature . Justify? (12 times)

Ans: <u>CO_2 is a gas while SiO_2 is solid:</u> Silicon atoms are much larger than carbon atoms and thus tend to surround themselves with more oxygen neighbours. Silicon forms only single bonds to oxygen atoms whereas carbon may form double bonds. Carbon, in fact forms double bond to each of the two oxygen atoms to produce a small, symmetrical, linear molecules CO_2, which is volatile and reasonably reactive.

47 Why liquid silicones are preferred over organic lubricants? (4 times)

Ans: The outstanding physical attribute of silicone oil is its very small change in viscosity with changing temperature, compared with the behaviour of other oils of similar viscosity. If the temperature is dropped from 100°C to 0°C the viscosity of petroleum oil may increase about one hundred folds, whereas, that of silicon oils will increase less than four folds, in the presence of air or oxygen at temperature as high as 300°C silicon oils remain free from acid formation, oxidation and similar phenomenon, which frequently limit the usefulness of petroleum products and other synthetic organic liquids.

48 State procedure by which surface of stoneware is made less porous?

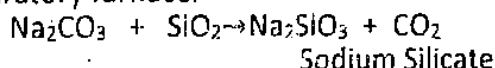
Ans: Stoneware are usually glazed to give it a less porous surface by throwing salt upon the articles while they are hot. This treatment produces sodium aluminate and sodium alumino silicate, which melt readily and cover the entire surface. When the article cools, the covering solidifies, producing a compact, smooth, waterproof surface.

49 What is vitreous silica? Give its two uses? (2 times)

Ans: Vitreous silica: When crystalline silica is heated sufficiently it melts to give a viscous liquid having a random structure, presumably with the silicon atoms still on the average closed to four oxygen atoms and the oxygen atoms close to two silicon atoms. When this liquid silica is cooled it does not crystallize readily, but usually it undercools tremendously and eventually becomes rigid without having undergone orientation into a regular crystal pattern.

50 How lime and sand are used to make glass?

Ans: Water glass or soluble glass (Sodium Silicate) is prepared by fusing sodium carbonate (lime) with pure sand (silica). This process is carried out in a furnace called reverberatory furnace.

$$Na_2CO_3 + SiO_2 \rightarrow \underset{\text{Sodium Silicate}}{Na_2SiO_3} + CO_2$$

Topic No: 3.5.3: Silcates and Their Uses:

51 Write four uses of Sodium Silicate? (6 times)

Ans: (i). It is used as filler for soap in soap industry. (ii). It is used in textile as a fire proof. (iii). It is used as furniture polish. (iv). It is used in calico printing.

52 How boric acid reat with following reagents? (2 times)

(a) Ethyl alcohol (b) NaOH

Ans: Boric acid reacts with ethyl alcohol forming ethyl borate.

$$H_3BO_3 + 3C_2H_5OH \rightarrow (C_2H_5)_3BO_3 + 3H_2O$$

Boric acid partially neutralized by caustic soda to give borax.

$$4H_3BO_3 + 2NaOH \rightarrow Na_2B_4O_7 + 7H_2O$$

53 What is meant by chemical garden? (9 times)

Ans: Chemical garden: When crystals of soluble coloured salts like nickel chloride, ferrous sulphate, copper sulphate or cobalt nitrate, etc, are placed in a solution of sodium silicate, they produced a very beautiful growth, like plant, which is called chemical garden.

54 Borate glazes are better than silicate glazes. Explain? (3 times)

Ans: Boric acid is used in pottery as a glaze because borate glazes are more fusible than silicate glazes and possess a higher coefficient of thermal expansion.

55 Give the formula and use of Talc soap stone? (3 times)

Ans: Formula of soap stone: $Mg_3H_2(SiO_3)_4$

Use of soap stone: It is physically greasy to touch. Therefore it is used in making cosmetics. It is also used in making household articles.

56 What is asbestos? Give its two uses. (4 times)

Ans: Asbestos: Asbestos is hydrated calcium magnesium silicate $CaMg_3(SiO_3)_4$. It is commonly used in making incombustible fabrics and hardboards, etc.

57 Describe composition and use of chemical garden?

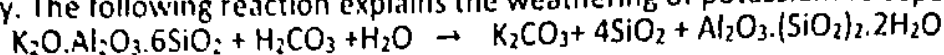
Ans: Composition: When crystals of soluble coloured salts like nickel chloride, ferrous sulphate, copper sulphate or cobalt nitrate, etc, are placed in a solution of

sodium silicate, they produced a very beautiful growth, like plant, which is called chemical garden.

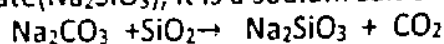
Use: The chemical garden relies on the fact that most transition metal silicates are insoluble in water and are coloured.

58 How weathering of potassium feldspar takes place? Give chemical equation also. **(2 times)**

Ans: Many important silicate rocks contain aluminium. The weathering of these rocks results in the disintegration of the complex silicates which they contain. The boiling and freezing of water in the rocks, and the chemical action of water and carbon dioxide convert these compounds into potassium carbonate, sand and clay. The following reaction explains the weathering of potassium feldspar:

$$K_2O.Al_2O_3.6SiO_2 + H_2CO_3 + H_2O \rightarrow K_2CO_3 + 4SiO_2 + Al_2O_3.(SiO_2)_2.2H_2O$$

59 What are silicates? Give example(2 times)

Ans: <u>**Silicates:**</u>Compounds derived from silicic acid (H_2SiO_3), are called silicates. For sodium silicate(Na_2SiO_3), it is a sodium salt of metasilicic acid.

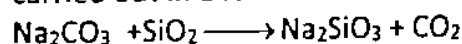
$$Na_2CO_3 + SiO_2 \rightarrow Na_2SiO_3 + CO_2$$

60 How Clay Articles are glazed.

Ans: Clay articles are glazed by boric acid because borate glazes possesses a higher coefficient of thermal expansion.

61 What is sodium silicate; how it can be prepared.

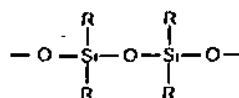
Ans: <u>**Sodium silicate:**</u>

This is sodium salt of metasilicic acid H_2SiO_3. It is known as water glass or soluble glass. It is prepared by fusing sodium carbonate with pure sand. The process is carried out in a furnace called reverberatory furnace.

$$Na_2CO_3 + SiO_2 \longrightarrow Na_2SiO_3 + CO_2$$

Topic No: 3.5.4: Silicones:

62 What are silicones ? Give two uses. **(4 times)**

Ans: <u>**Silicones:**</u>Silicones are synthetic polymers of composition

$$-O-\overset{R}{\underset{R}{Si}}-O-\overset{R}{\underset{R}{Si}}-O-$$

One of the common silicone is methyl silicone.

<u>**Uses:**</u> (i). Methyl silicones of high molecular mass resemble rubber and are used in making rubberlike tubing and sheets.

(ii). These are used to make various surfaces to make them water repellent. A silicone film covers the surface and repels water like a grease film.

63 Write two uses of silicones.

Ans: (i).Methtyl silicones are oily liquids and they become more viscous as the chain length increases. They are used as lubricants either incorporated in greases or as oils, in bearings, gears etc.

(ii).They are used in hydraulic brakes and other hydraulic system

(iii). Methyl silicones of high molecular mass resembles rubber and are used in making rubber like tubbing and sheets.

Topic No: 3.6: Semi-Conductors:

64 What is effect of temperature on semiconductor? (3 times)

Ans: The electrical conductivity of semiconductor depends upon their temperature. When a metal is heated, its resistance increases, when a semiconductor is heated its resistance decreases and vise versa.

65 How semiconductors are used in transistors?

Ans: Semiconductors may joined to other material, which may be a metal or a different semiconductor. The junction between the different materials form a boundary. It allows electricity to pass more properly and is used in transistors.

66 Which elements and compounds can act as semiconductors?

Ans: **Elements:** Semiconductor include the elements germanium, selenium and silicon.

Compounds: Semiconductor include the compounds lead sulphide, silicon carbide, cadmium sulphide, lead telluride, gallium arsenide and indium antimonide.

67 How semiconductor conduct electricity better than Insulators?

Ans: **Conductance of electricity:**

Semiconductor conduct electricity depending upon their temperature. When a metal is heated its resistance increases, while a semiconductor is heated its resistance decreases. While insulators don't conduct electricity.

Topic No: 3.7: Uses of Lead Compounds in Paints:

68 White lead is not a good pigment. Give reason? (4 times)

Ans: Basic lead carbonate $2PbCO_3.Pb(OH)_2$ is an amorphous white pigment. White lead is not suitable for use as good pigment since it is darkened by the hydrogen sulphide which is frequently present in the atmosphere.

69 What is the effect of temperature at 340°C and 470°C when red lead is heated?

Ans: **Effect of temperature on red lead at 340°C:**

When white lead is heated in air at about 340°C, it absorbs oxygen and forms a bright scarlet crystalline powder of read lead. $3Pb + 2O_2 \rightarrow Pb_3O_4$

Effect of temperature on red lead at 470°C :

It decomposes at 470°C $2Pb_3O_4 \rightarrow 6PbO + O_2$

70 Discuss use of $PbCrO_4$ in paints?

Ans: It is used as a pigment under the name of chrome yellow. Orange or red basic lead chromates are formed when lead chromate is boiled with dilute alkali and are used as pigments. The stable yellow modification of lead chromate is monoclinic. Mixture of lead chromate with lead sulphate or barium sulphate are also used as yellow pigments

71 Give uses of Lead Suboxide?

Ans: It is a black powder, obtained on heating plumbous oxalate in the absence of air. Other than pigments, it is used in the manufacture of lead storage batteries.

72 Write short note on white lead and lead chromate?

Ans: **White lead:** Basic lead carbonate $2PbCO_3.Pb(OH)_2$ is an amorphous white pigment. It mixes readily with linseed oil and has a good covering powder. White lead is not suitable for use as a good pigment since it is darkened by the hydrogen sulphide which is frequently present in the atmosphere.

Lead chromate: It is used as a pigment under the name of chrome yellow. Orange or red basic lead chromates are formed when lead chromate is boiled with dilute alkali hydroxide and are used as pigments. The stable yellow modification of lead chromate is monoclinic. Mixture of lead chromate with lead sulphate or barium sulphate are also used as yellow pigments.

73 What is formula of red lead? Give its principle uses.

Ans: **Formula of red lead:**

Formula of red lead is triplumbic tetra oxide, Pb_3O_4. Red lead is used as variety of purposes. Its principal uses are in the manufacturing of storage batteries, as a pigments in paints applied to steel and iron to retard corrosion, and as an ingredient in the manufacturing of flint glass, matches and ceramic glazes.

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74. Write down chemical formulae of minerals (a) Kaolin (b)_cryolite

Ans. Kaolin ___ $Al_2O_3.2SiO_2.2H_2O$

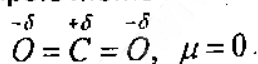
cryolite ___ Na_3AlF_6

75. How Kaolin differs from ordinary clay?

Ans: Ordinary clay contains compounds of iron and other metals and it has a yellow or reddish yellow color. Kaolin is pure clay $(Al_2O_3.2SiO_2.2H_2O)$ and is white.

76. CO_2 is non-polar in nature.

Ans: CO_2 molecule is non-polar because it is linear and individual bond moments cancel each other and net dipole moment is zero.

$$\overset{-\delta}{O} = \overset{+\delta}{C} = \overset{-\delta}{O}, \ \mu = 0$$

77. Write down chemical formulae of minerals (i) Emerald (ii) Gibbsite

Ans: Emerald: $Al_2F_2SiO_4$

Gibbsite: $Al_2O_3.3H_2O$ or $Al(OH)_3$

78. Write down four properties of vitreous silica.

Ans: Properties of Vitreous silica

1. High transparency to light
2. Very low thermal expansion.
3. Hard, brittle and elastic.
4. Excellent insulator.

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79. Write down formulas of the following minerals: (a) Galena (b) Heavy Spar

Ans: (a) Galena: PbS

(b) Heavy Spar: $BaSO_4$

80. Write the Chemical Formulae of (a) Corundum (b) Cryolite

Ans: (a) Corundum: Al_2O_3

(b) Cryolite: Na_3AlF_6

CHAPTER NO:3 LONG QUESTIONS GROUP IIIA AND GROUP IVA ELEMENTS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 3.1

1. Describe four points of peculiar behavior of Boron.

Ans: (Text Book Page No:39)

Topic No: 3.2.1

2. Explain that aqueous solution of borax is alkaline in nature.

Ans: (Text Book Page No:42)

3. Write two preparations and two chemical reactions of Borax.

Ans: (Text Book Page No:39)

4. Write down two methods for the preparation of borax. Also explain the action of heat on borax. (2 times)

Ans: (Text Book Page No:39)

5. Explain borax bead test with its chemistry

Ans: (Text Book Page No:41)

Topic No: 3.2.2

6. How will you convert boric acid into borax and vice versa?

Ans: (Text Book Page No:41)

7. Give one method for the preparation of H_3BO_3. How does it react with C_2H_5OH, $NaOH$, Na_2CO_3.

Ans: (Text Book Page No:42)

8. Discuss effect of heat on boric acid

Ans: (Text Book Page No:42)

9. What is boric acid? Give its properties.

Ans: (Text Book Page No:41+42)

Topic No: 3.3

10. How and under what conditions does aluminium react with : (i) O_2 (ii) $NaOH$ (iii) H_2SO_4 (iv) N_2

Ans: (Text Book Page No:43)

Topic No: 3.5

11. Write a method of preparation of water glass. Also write uses of water glass.

Ans: (Text Book Page No:48)

Topic No: 3.5.3

12. Write a note on aluminium silicate.

Ans: (Text Book Page No:48)

Topic No: 3.5.4

13. What are silicones? Give its formula. Write any four uses of silicones.

Ans: (Text Book Page No:49)

Topic No: 3.6

14. Define semi-conductors. Give example. Write two properties and two uses of semi-conductors.

Ans: (Text Book Page No:50)

Topic No: 3.7

15. Discuss the Importance of Oxides of Lead in Paints.

Ans: (Text Book Page No:51)

CHAPTER NO:4 OBJECTIVES (MCQ'S) GROUP VA AND GROUP VIA ELEMENTS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 4.1: Introduction: (Group VA Elements):

1. Among group VA elements, the most electronegative is: (6 times)
(a)Sb (b)N (c)P (d) As

2. Out of all the elements of group VI-A the highest melting and boiling points is shown by the elements. (2 times)
(a)Te (b) Se (c)S (d)Po

3. A gas which burns with blue flame is: (18 times)
(a) CO_2 (b) NO (c) CO (d) N_2

4. Laughing gas is chemically: (18 times)
(a) NO (b) NO_2 (c) N_2O (d) N_2O_4

5. Which of the following species has the maximum number of unpaired electrons? (7 times)
(A) O_2 (B) O_2^+ (C) O_2^- (D) O_2^{-2}

6. Which of the following elements is not present abundantly in earth crust?
(a) Calcium (b) Sodium (c) Phosphorous (d) Nitrogen

7. Point out the element whose inorganic minerals are not much abundant in earth crust:
(a) Li (b) N (c) Na (d) O

8- Out of all the elements of group VA, the highest Ionization Energy is possessed by: (2 times)
(a) N (b) P (c) Sb (d) Bi

Topic No: 4.2.2: Oxides of Nitrogen:

9. Oxidation of NO in air produces: (10 times)
(a)NO_2 (b) N_2O_3 (c) N_2O_4 (d)N_2O_5

10. NO_2 is called:
(a)Nitrogen dioxide (b) Nitrous oxide (c)Nitric oxide (d)Nitric anhydride

11. If N_2O is exposed to a person it causes disease:
(a)Cancer (b) Sleeping sickness (c)Hysterical laughter (d)Tumor

Topic No: 4.2.3: Oxyacids of Nitrogen:

12. Which of the following is a reddish brown gas, when metal reduces HNO_3? (3 times)
(a) N_2O (b) NO (c)N_2O_5 (d)NO_2

13. The brown gas formed when metal reduces $HNO_3$is: (6 times)
(a)N_2O_5 (b) N_2O_3 (c)NO_2 (d)NO

Topic No: 4.3: Phosphorus and its Compounds:

14. Which catalyst is used in contact process for manufacture of H_2SO_4? (12 times)
(a)Fe_2O_3 (b) V_2O_5 (c)Al_2O_3 (d)MnO_2

15. The most reactive allotropic form of phosphorus is:
(a) White (b) Red (c)Black (d)None of these

2019

16. **Maximum electronegative character is present in**

(a) Sb (b) N (c) P (d) Si

2021

17. **Nitric acid does not react with all metals given, except:**

(a) Gold (b) Platinum (c) Magnesium (d) Iridium

18. **Which of the following catalyst is used in contact process:(2 Times)**

(a) NO_2 (b) V_2O_5 (c) SO_3 (d) Ag_2O

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10
B	D	C	C	A	D	B	A	A	A
11	12	13	14	15	16	17	18		
C	D	C	B	A	B	D	B		

CHAPTER NO:4 SHORT QUESTIONS GROUP VA AND GROUP VIA ELEMENTS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 4.1.1: General Characteristics:

1 **How does nitrogen differ from other element of its group?Give four points.** **(3 times)**

Ans: (i). Nitrogen is a gas (ii). It is poor conductor of heat and electricity

(iii). Its compounds are predominately covalent in nature

(iv). Nitrogen has great tendency to attract electrons

Topic No: 4.2: Nitrogen and its compounds:

2 **Why Nitrogen is chemically inert at room temperature?**

Ans: Nitrogen has five electrons in its outermost shell, it form triple bond with other nitrogen to complete its octet. So nitrogen molecule is stable molecule. It does not react under ordinary conditions. It is chemically inert at room temperature.

3 **Why Dinitrogen Oxide is called "laughing gas"?**

Ans: Its mixture with a little oxygen, if inhaled for a sufficiently long time, produces hysterical laughter, hence it is also known as "laughing gas".

4 **"N_2O supports combustion" Give two reactions in favour of the statement? / Write two reactions which show oxidizing behavior of N_2O.** **(4 times)**

Ans: **N₂O supports combustion:** It supports combustion if burning substances, such as sulphur, phosphorus, etc. are taken in the cylinder containing this gas.

$S_{(s)} + 2N_2O_{(g)} \rightarrow SO_{2(g)} + 2N_{2(g)}$

$P_{4(s)} + 10N_2O_{(g)} \rightarrow P_4O_{10(s)} + 10N_{2(g)}$

5 **Describe "Ring test" for confirmation of presence of nitrate ions in solution?** **(5 times)**

Ans: **Ring test:** To the aqueous solution of NO_3^- ions add $FeSO_4$ solution. Shake it well and add concentrated H_2SO_4 along the side of test tube. It forms a ring of brown coloured addition compound at the junction of two liquids due to the addition compound formed by the action of NO produced with $FeSO_4$.

$FeSO_{4(aq)} + NO_{(g)} \rightarrow FeSO_4.NO_{(aq)}$

6. **Write two reactions of NO with (a) $FeSO_4$ (b) H_2S** **(2 times)**

Ans: **Reactions of NO:**

$NO + FeSO_4 \longrightarrow FeSO_4.NO$

$2NO + H_2S \longrightarrow H_2O + N_2O + S$

7 **Complete and balance the equations: (a) $FeSO_4(ab)+NO(g) \Rightarrow$ (b) $NO+Cl_2 \Rightarrow$**

Ans: (a) $FeSO_{4(aq)} + NO_{(g)} \longrightarrow FeSO_4.NO_{(aq)}$

(b) $2NO_{(g)} + Cl_{2(g)} \longrightarrow 2NOCl_{(g)}$

8 What happens when NO_2 is dissolved in water? (2 times)

Ans: **(i). In the absence of oxygen:** In the absence of air, it dissolves in water to form nitric and nitrous acids.

$$2NO_{2(g)} + H_2O_{(l)} \rightarrow HNO_{3(aq)} + HNO_{2(aq)}$$

(ii). In the presence of oxygen: In the presence of air or oxygen, it dissolves in water and nitric is the final product.

$$4NO_{2(g)} + 2H_2O_{(l)} + O_{2(g)} \rightarrow 4HNO_{3(aq)}$$

9 Justify that NO_2 acts as an oxidizing agent? (8 times)

Ans: It is strong oxidizing agent and oxidizes H_2S to sulphur, ferrous sulphate to ferric sulphate and KI to I_2.

$NO_{2(g)} + H_2S_{(g)} \rightarrow S_{(s)} + NO_{(g)} + H_2O_{(l)}$

$NO_{2(g)} + 2FeSO_{4(aq)} + H_2SO_{4(aq)} \rightarrow Fe_2(SO_4)_{3(aq)} + NO_{(g)} + H_2O_{(l)}$

$2NO_{2(g)} + 2KI_{(aq)} \rightarrow 2KNO_{2(aq)} + I_{2(s)}$

10 Write names and formulas of oxyacids of nitrogen.

Ans:

	Name	Formula
1.	Nitrous Acid	HNO_2
2.	Nitric Acid	HNO_3

11 NO_2 is strong oxidizing agent. Prove with help of two chemical reactions?

Ans: It is strong oxidizing agent and oxidizes H_2S to sulphur, ferrous sulphate to ferric sulphate and KI to I_2. $NO_{2(g)} + H_2S_{(g)} \rightarrow S_{(s)} + NO_{(g)} + H_2O_{(l)}$

$NO_{2(g)} + 2FeSO_{4(aq)} + H_2SO_{4(aq)} \rightarrow Fe_2(SO_4)_{3(aq)} + NO_{(g)} + H_2O_{(l)}$

$2NO_{2(g)} + 2KI_{(aq)} \rightarrow 2KNO_{2(aq)} + I_{2(s)}$

12 Complete and balance the given equations: (2 times)

(a) $HNO_2 + (NH_2)_2CO \rightarrow$? (b) $NO_2 + P \rightarrow$?

Ans: **Chemical Reactions:**

(a) $2HNO_{2(aq)} + (NH_2)_2CO_{(aq)} \rightarrow 2N_{2(g)} + CO_{2(s)} + 3H_2O_{(l)}$

(b) $5NO_{2(g)} + 2P_{(s)} \rightarrow P_2O_{5(s)} + 5NO_{(g)}$

13 Give reaction of Cu with dil. HNO_3 and conc. HNO_3. (2 times)

Ans: Cu give nitric oxide with diluted HNO_3.

(i). $3Cu_{(s)} + 8HNO_{3(dil)} \rightarrow 3Cu(NO_3)_{2(aq)} + 2NO_{(g)} + 4H_2O_{(l)}$

Cu give nitrogen dioxide with concentrated HNO_3.

(ii). $Cu_{(s)} + 4HNO_{3(Conc.)} \rightarrow Cu(NO_3)_{2(aq)} + 2NO_{2(g)} + 2H_2O_{(l)}$

14 Give reactions of NO_2 with (a) H_2S (b) KI (2 Times)

Ans: (a) $H_2S_{(g)} + NO_{2(g)} \longrightarrow H_2O_{(\ell)} + S_{(s)} + NO_{(g)}$

(b) $2KI_{(aq)} + 2NO_{2(g)} \longrightarrow KNO_{3(g)} + I_{2(g)}$

Topic No: 4.2.3: Oxyacids of Nitrogen:

15 How aqua regia dissolved gold and platinum? (12 times)

Ans: When one volume of concentrated HNO_3 is mixed with three volume of concentrated HCl, aqua regia is formed. It is employed to dissolve gold and platinum. $HNO_{3(conc.)} + 3HCl_{(conc.)} \rightarrow NOCl_{(aq)} + Cl_{2(g)} + 2H_2O_{(l)}$

NOCl formed is decomposed giving NO and Cl_2. $NOCl_{(g)} \rightarrow 2NO_{(g)} + Cl_{2(g)}$

This liberate chlorine gas converts noble metals such as gold and platinum into their water soluble chlorides. $2Au + 3Cl_2 \rightarrow 2AuCl_3$

$2Pt + 6Cl_2 \rightarrow 2PtCl_6$

Preparation of red phosphorous form white phosphorous

It is prepared by heating white phosphorus in the presence of a little iodine or sulphur as a catalyst upto250ºC in vacuum.

16 Write any four uses of nitric acid? (2 times)

Ans: (i). It is used as laboratory reagent.

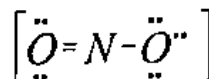
(ii). It is used in manufacturing of explosives.

(iii). It is used in manufacturing of nitrogen fertilizers.

(iv). It is used to make varnishes and organic dyes.

17 Write structure of N_2O and NO_2?

Ans: (i). Structure of dinitrogen oxide (N_2O): $\left[\overset{-}{N} = \overset{+}{N} = O \leftrightarrow N \equiv \overset{+}{N} - \overset{-}{O}\right]$

(II). Structure of nitrogen dioxide (NO_2) : $[\ddot{O}=N-\ddot{O}^{\cdot}]$

18 **How NO acts as reducing agent? Give two examples.**

Ans: **NO as reducing agent:**

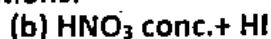
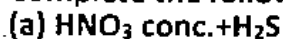
When NO reacts with an oxidizing agent it converts to NO_2. Here it act as reducing agent.

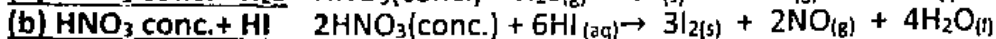
1. $2HNO_3(conc.) + NO_{(aq)} \rightarrow H_2O_{(aq)} + 3NO_{2(g)}$

Also,

2. $10NO_{(aq)} + 6KMnO_{4(aq)} + 12H_2SO_{4(aq)} \rightarrow 6KHSO_{4(aq)} + 6MnSO_{4(aq)} + 10HNO_{3(aq)} + 4H_2O_{(l)}$

19 **Complete the following reactions:**

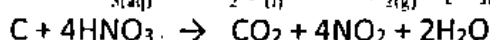
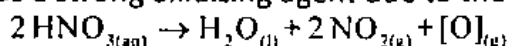
(a) HNO_3 conc.+H_2S **(b) HNO_3 conc.+ HI**

Ans: **(a) HNO_3 conc.+ H_2S** $HNO_3(conc.) + H_2S_{(g)} \rightarrow 3S_{(s)} + 2NO_{(g)} + 4H_2O_{(l)}$

(b) HNO_3 conc.+ HI $2HNO_3(conc.) + 6HI_{(aq)} \rightarrow 3I_{2(s)} + 2NO_{(g)} + 4H_2O_{(l)}$

20 **How does HNO_3 act as an oxidizing agent?** **(5 times)**

Ans: **Action of HNO_3 as an oxidizing agent:**

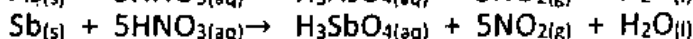
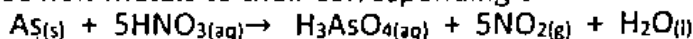
It acts as a strong oxidizing agent due to the ease with which it is decomposed.

$$2HNO_{3(aq)} \rightarrow H_2O_{(l)} + 2NO_{2(g)} + [O]_{(g)}$$

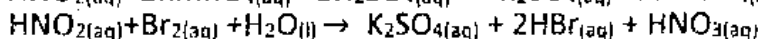
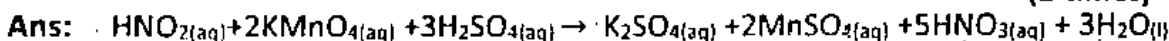
$$C + 4HNO_3 \rightarrow CO_2 + 4NO_2 + 2H_2O$$

21 **Write two properties of HNO_3 in which it acts as an oxidizing agent? (2 times)**

Ans: It oxidize non-metals to their corresponding oxides.

$$As_{(s)} + 5HNO_{3(aq)} \rightarrow H_3AsO_{4(aq)} + 5NO_{2(g)} + H_2O_{(l)}$$

$$Sb_{(s)} + 5HNO_{3(aq)} \rightarrow H_3SbO_{4(aq)} + 5NO_{2(g)} + H_2O_{(l)}$$

22 **Nitrous acid decolourizes acidified $KMnO_4$ and bromine water. Give reactions.** **(2 times)**

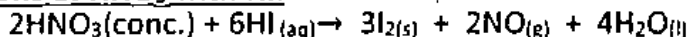
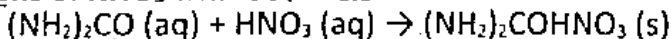
Ans: $HNO_{2(aq)} + 2KMnO_{4(aq)} + 3H_2SO_{4(aq)} \rightarrow K_2SO_{4(aq)} + 2MnSO_{4(aq)} + 5HNO_{3(aq)} + 3H_2O_{(l)}$

$HNO_{2(aq)} + Br_{2(aq)} + H_2O_{(l)} \rightarrow K_2SO_{4(aq)} + 2HBr_{(aq)} + HNO_{3(aq)}$

23 **Write balanced equation for reactions of HNO_3 with: (a)HI** **(b)$CO(NH_2)_2$**

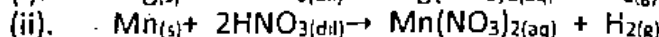
Ans: **Reactions of HNO_3 with HI:**

$$2HNO_3(conc.) + 6HI_{(aq)} \rightarrow 3I_{2(s)} + 2NO_{(g)} + 4H_2O_{(l)}$$

Reactions of HNO_3 with $CO(NH_2)_2$:

$$(NH_2)_2CO\ (aq) + HNO_3\ (aq) \rightarrow (NH_2)_2COHNO_3\ (s)$$

24 **Write reactions of two metals which evolve hydrogen upon reaction with HNO_3?** **(3 times)**

Ans: (i). $Mg_{(s)} + 2HNO_{3(dil)} \rightarrow Mg(NO_3)_{2(aq)} + H_{2(g)}$

(ii). $Mn_{(s)} + 2HNO_{3(dil)} \rightarrow Mn(NO_3)_{2(aq)} + H_{2(g)}$

25 **How HNO_3 can be prepared in the laboratory?**

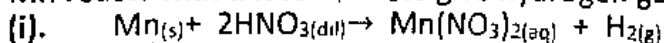
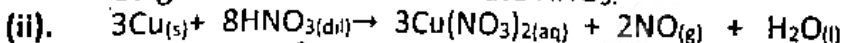
Ans: In laboratory, nitric acid is prepared by heating potassium nitrate crystals with concentrated sulphuric acid. $KNO_{3(s)} + H_2SO_{4(conc.)} \rightarrow KHSO_{4(aq)} + HNO_{3(aq)}$

26 **How does dilute HNO_3 react with Mn and Cu?**

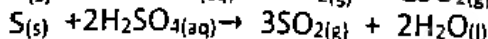
Ans: Mn reacts with dilute HNO_3 to give hydrogen gas.

(i). $Mn_{(s)} + 2HNO_{3(dil)} \rightarrow Mn(NO_3)_{2(aq)} + H_{2(g)}$

Cu give nitric oxide with dilute HNO_3.

(ii). $3Cu_{(s)} + 8HNO_{3(dil)} \rightarrow 3Cu(NO_3)_{2(aq)} + 2NO_{(g)} + H_2O_{(l)}$

27 **Give the reactions of HNO_3 with carbon and sulphur?**

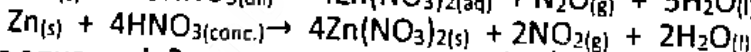
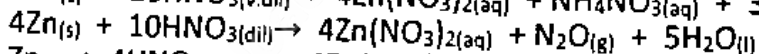
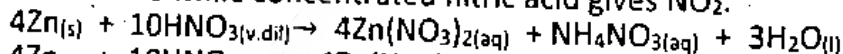
Ans: $C_{(s)} + 2H_2SO_{4(aq)} \rightarrow CO_{2(g)} + 2SO_{2(g)} + 2H_2O_{(l)}$

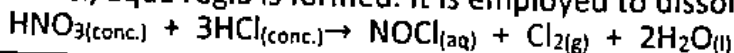
$S_{(s)} + 2H_2SO_{4(aq)} \rightarrow 3SO_{2(g)} + 2H_2O_{(l)}$

28 **Write reactions of Nitric acid with Zinc?**

Ans: Zinc give different products depending upon the concentration of acid and temperature. Very dilute nitric acid gives NH_4NO_3. Moderately diluted nitric acid gives nitrous oxide while concentrated nitric acid gives NO_2.

$$4Zn_{(s)} + 10HNO_{3(v.dil)} \rightarrow 4Zn(NO_3)_{2(aq)} + NH_4NO_{3(aq)} + 3H_2O_{(l)}$$

$$4Zn_{(s)} + 10HNO_{3(dil)} \rightarrow 4Zn(NO_3)_{2(aq)} + N_2O_{(g)} + 5H_2O_{(l)}$$

$$Zn_{(s)} + 4HNO_{3(conc.)} \rightarrow 4Zn(NO_3)_{2(s)} + 2NO_{2(g)} + 2H_2O_{(l)}$$

29 **What is aqua-regia?** **(7 times)**

Ans: **Aqua Regia:** When one volume of concentrated HNO_3 is mixed with three volume of concentrated HCl, aqua regia is formed. It is employed to dissolve gold and platinum. $HNO_{3(conc.)} + 3HCl_{(conc.)} \rightarrow NOCl_{(aq)} + Cl_{2(g)} + 2H_2O_{(l)}$

Topic No: 4.3: Phosphorus and Its Compounds:

30 **Write the formulas of (a) Phosphorite (b) Chile saltpeter.**

Ans: (a) Phosphorite: $Ca_3(PO_4)_2$ (b) Chile saltpeter : $NaNO_3$

Topic No: 4.3.2: Allotropes of Phosphorus:

31 **Name three allotropic forms of phosphorous?**

Ans: **Allotropic forms of phosphorous:** Phosphorus can exist in at least six different solid allotropic forms. But here mentioned only three.

(i). White phosphorus (P_4) (ii). Red phosphorus (macromolecule of P_4)

(iii). Black phosphorus (high temperature heating of red P)

32 **Give molecular structure of red phosphorous. How it is prepared form white phosphorous?**

Ans: **Molecular structure of red phosphorous:**

Red Phosphorous

33 **Give definition of allotropy. Write allotropes of phosphorus.**

Ans: **Definition:** When an element exist in different crystalline forms. These crystalline forms are called allotropic forms and this phenomenon is called allotropy.

Allotropic forms of phosphorous: Phosphorus can exist in at least six different solid allotropic forms. But here mentioned only three.

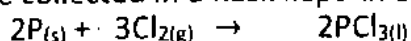
(i). White phosphorus (P_4) (ii). Red phosphorus (macromolecule of P_4)

(iii). Black phosphorus (high temperature heating of red P)

Topic No: 4.3.3: Halides of Phosphorus:

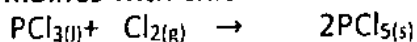
34 **Howphosphorus forms PCl_3 and PCl_5?**

Ans: PCl_3 is usually prepared by melting white phosphorus in a retort in an inert atmosphere of CO_2 and current of dried chloride is passed over it. The vapoursof PCl_3 are collected in a flask kept in an ice bath.

$$2P_{(s)} + 3Cl_{2(g)} \rightarrow 2PCl_{3(l)}$$

It may be prepared by the action of phosphorus with thionyl chloride.

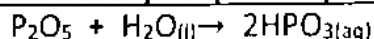
$$2P_{(g)} + 4SOCl_{2(g)} \rightarrow 2PCl_{3(l)} + 2SO_{2(g)} + S_2Cl_{2(s)}$$

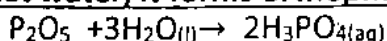
PCl_3 combines with chlorine to form phosphorus pentachloride.

$$PCl_{3(l)} + Cl_{2(g)} \rightarrow 2PCl_{5(s)}$$

Topic No: 4.3.4: Oxides of Phosphorus:

35 **How does P_2O_5 react with water in cold and & state?** **(4 times)**

Ans: **With cold water phosphorus pentoxide forms metaphosphoric acid as:**

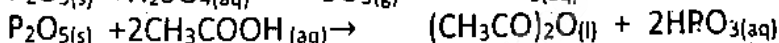
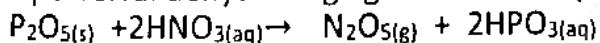
$$P_2O_5 + H_2O_{(l)} \rightarrow 2HPO_{3(aq)}$$

With hot water, it forms orthophosphoric acid as:

$$P_2O_5 + 3H_2O_{(l)} \rightarrow 2H_3PO_{4(aq)}$$

36 **$P_2O_5$is a powerful dehydrating agent. Give two examples.** **(9 times)**

Ans: P_2O_5 is a powerful dehydrating agent. For example:

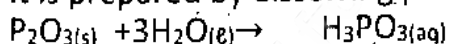
$$P_2O_{5(s)} + 2HNO_{3(aq)} \rightarrow N_2O_{5(g)} + 2HPO_{3(aq)}$$

$$P_2O_{5(s)} + H_2SO_{4(aq)} \rightarrow SO_{3(g)} + 2HPO_{3(aq)}$$

$$P_2O_{5(s)} + 2CH_3COOH_{(aq)} \rightarrow (CH_3CO)_2O_{(l)} + 2HPO_{3(aq)}$$

Acetic anhydride

37 **Write two reactions for the Preparation of Phosphorus acid.**

Ans: (i) It is prepared by dissolving phosphorus trioxide in cold water.

$$P_2O_{3(s)} + 3H_2O_{(\ell)} \rightarrow H_3PO_{3(aq)}$$

It is also obtained by the hydrolysis of phosphorus trichloride.

$$PCl_{3(\ell)} + 3H_2O_{(\ell)} \rightarrow H_3PO_{3(aq)} + 3HCl_{(aq)}$$

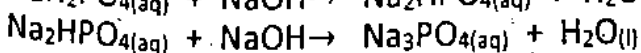
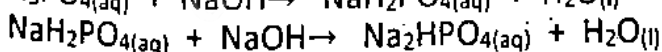
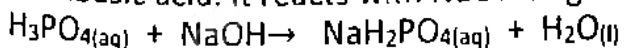
Topic No: 4.3.5: Oxyacids of Phosphorus:

38 **Phosphoric acid is a weak tribasic acid, Give its 3 reaction of different salts.**

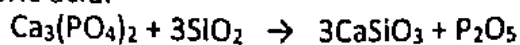
Ans: It is weak tribasic acid. It reacts with NaOH to give three series of salts.

$$H_3PO_{4(aq)} + NaOH \rightarrow NaH_2PO_{4(aq)} + H_2O_{(l)}$$

$$NaH_2PO_{4(aq)} + NaOH \rightarrow Na_2HPO_{4(aq)} + H_2O_{(l)}$$

$$Na_2HPO_{4(aq)} + NaOH \rightarrow Na_3PO_{4(aq)} + H_2O_{(l)}$$

39 How H_3PO_4 is prepared on large scale? (2 times)

Ans: On large scale H_3PO_4 can be prepared by heating a mixture of phosphorite(Bone Ash) and sand in electric furnas. The P_2O_5 formed is treated with hot water to obtain phosphoric acid.

$$Ca_3(PO_4)_2 + 3SiO_2 \rightarrow 3CaSiO_3 + P_2O_5$$
$$P_2O_5 + 3H_2O \rightarrow 2H_3PO_4$$

40 Give name and formulas of Oxyacids of Phosphorous.

Ans:

Name	Formula
Phosphoric acid	H_3PO_3
Orthophosphoric acid	H_3PO_4
Pyrophosphoric acid	$H_4P_2O_7$
Metaphosphoric acid	HPO_3

Topic No: 4.4.3: Occurrence of Sulphur:

41 Write two dissimilarities of oxygen and sulphur? (7 times)

Ans: Dissimilarities of oxygen and sulphur:

	Oxygen	Sulphur
1	It is gas at ordinary temperature.	It is solid at ordinary temperature.
2	Oxygen is sparingly soluble in water.	Sulphur is not soluble in water.
3	It is paramagnetic in nature.	It is diamagnetic in nature.

42 Write down four properties to compare oxygen with sulphur? (4 times)

Ans: Properties to compare oxygen with sulphur:

.	Oxygen	Sulphur
1	It is gas at ordinary temperature.	It is solid at ordinary temperature.
2	Oxygen is sparingly soluble in water.	Sulphur is not soluble in water.
3	It is paramagnetic in nature.	It is diamagnetic in nature.
4	It does not react with acids.	It is readily oxidized by conc. sulphuric acid or nitric acid.

43 How does sulphur occur in nature?

Ans: Occurrence of Sulphur:

Sulphur is widely distributed in nature both as free and combined forms. Many important metallic ores are sulphides, e.g. galena (PbS), Zinc Blende (ZnS), cinnabar (HgS), stibnite (Sb_2S_3), copper pyrite (Cu_2S. Fe_2S_3), iron pyrite (FeS_2). Sulphur also occur in organic compounds present in animals and vegetables. Onion, garlic, mustard, hair, many oils, egg and proteins consists of compounds containing sulphur in them. It also occur as a constituent of coal and petroleum.

Topic No: 4.5.1: Manufacture of Sulphuric Acid:

44 State the principle of contact process for manufacture of sulphuric acid?

Ans: (i). SO_2 obtained by burning sulphur or iron pyrites is oxidized to SO_3 in the presence of V_2O_5 which acts as a catalyst.

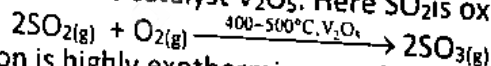
(ii). The best yield of SO_3 can be obtained by using excess of oxygen or air and keeping the temperature between 400-500ºC.

(iii). SO_3 is absorbed in concentrated H_2SO_4 and "Oleum"($H_2S_2O_7$) formed can be converted to sulphuric acid of any strength by mixing adequate quantities of water.

45 Why $SO_3$is dissolved in H_2SO_4 and not in water? (12 times)

Ans: $SO_3$is not directly dissolved in water, since absorption is incomplete and mist of SO_3andH_2SO_4 fills the factory, which causes great inconvenience to the workers. Therefor, SO_3 is absorbed in concentrated H_2SO_4 and "Oleum"($H_2S_2O_7$) formed can be converted to sulphuric acid of any strength by mixing adequate quantities of water.

46 Write the chemical reactions which takes place in contact chamber?

Ans: Pre-heated gases at 400-500ºCare passed through vertical iron columns packed with the catalyst V_2O_5. Here $SO_2$is oxidized to SO_3.

$$2SO_{2(g)} + O_{2(g)} \xrightarrow{400-500^\circ C, V_2O_5} 2SO_{3(g)} \quad H= -269.3 \text{ kJ/mol}$$

Reaction is highly exothermic so no heating is required once reaction is started.

47 What are the optimum condition for the manufacture of H_2SO_4 in the contact process? **(2 times)**

Ans: (i). **Catalyst:** SO_2 obtained by burning sulphur or iron pyrites is oxidized to SO_3 in the presence of V_2O_5 which acts as a catalyst.

(ii). **Temperature:** The best yield of SO_3 can be obtained by using excess of oxygen or air and keeping the temperature between 400-500ºC.

(iii). **Absorbing:** SO_3 is absorbed in concentrated H_2SO_4 and "Oleum"($H_2S_2O_7$) formed can be converted to sulphuric acid of any strength by mixing adequate quantities of water.

47 Give reactions of contact process for the manufacturing of Sulphuric acid.

Ans: **Reactions of contact process:**

Sulphur Burner:

$S_{(s)} + O_{2(g)} \longrightarrow SO_{2(g)}$

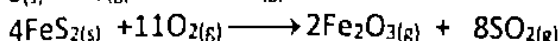
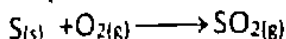
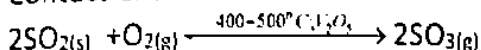
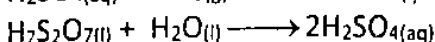
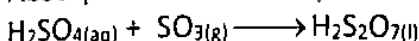
$4FeS_{2(s)} + 11O_{2(g)} \longrightarrow 2Fe_2O_{3(g)} + 8SO_{2(g)}$

Contact Chamber:

$2SO_{2(s)} + O_{2(g)} \xrightarrow{400-500^\circ C, V_2O_5} 2SO_{3(g)}$

Absorption Unit:

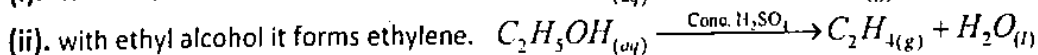
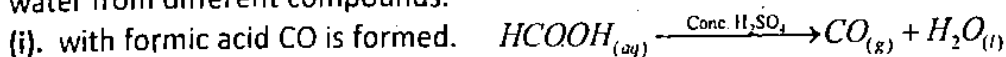
$H_2SO_{4(aq)} + SO_{3(g)} \longrightarrow H_2S_2O_{7(l)}$

$H_2S_2O_{7(l)} + H_2O_{(l)} \longrightarrow 2H_2SO_{4(aq)}$

Topic No: 4.5.2: Reactions of Sulphuric Acid:

48 Write two reactions in which sulphuric acid acts as a dehydrating agent? **(10 times)**

Ans: H_2SO_4 has great affinity for water, so it act as dehydrating agent and eliminates water from different compounds.

(i). with formic acid CO is formed. $HCOOH_{(aq)} \xrightarrow{Conc.\ H_2SO_4} CO_{(g)} + H_2O_{(l)}$

(ii). with ethyl alcohol it forms ethylene. $C_2H_5OH_{(aq)} \xrightarrow{Conc.\ H_2SO_4} C_2H_{4(g)} + H_2O_{(l)}$

49 How sulphuric acid act as an oxidizing agent? **(6 times)**

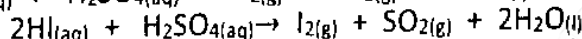
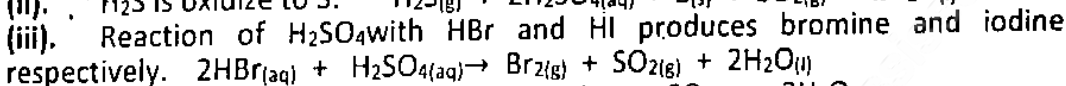
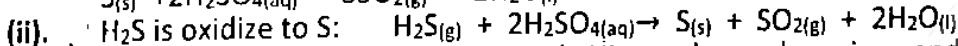
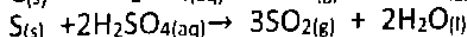
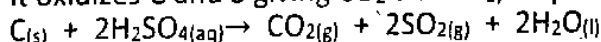
Ans: (i). It oxidizes C and S giving CO_2 and SO_2, respectively.

$C_{(s)} + 2H_2SO_{4(aq)} \rightarrow CO_{2(g)} + 2SO_{2(g)} + 2H_2O_{(l)}$

$S_{(s)} + 2H_2SO_{4(aq)} \rightarrow 3SO_{2(g)} + 2H_2O_{(l)}$

(ii). H_2S is oxidize to S: $H_2S_{(g)} + 2H_2SO_{4(aq)} \rightarrow S_{(s)} + SO_{2(g)} + 2H_2O_{(l)}$

(iii). Reaction of H_2SO_4 with HBr and HI produces bromine and iodine respectively. $2HBr_{(aq)} + H_2SO_{4(aq)} \rightarrow Br_{2(g)} + SO_{2(g)} + 2H_2O_{(l)}$

$2HI_{(aq)} + H_2SO_{4(aq)} \rightarrow I_{2(g)} + SO_{2(g)} + 2H_2O_{(l)}$

50 Give the advantage of contact process for the manufacture of sulphuric acid.

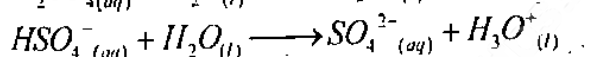
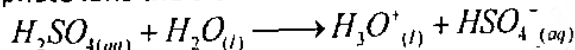
Ans: (i). Contact process gives good yield of sulphuric acid.

(ii). Contact process produce sulphuric acid which is in its pure form.

51 H_2SO_4 behaves as an Acid. Write two reactions to illustrate the truth.

Ans: It is a strong acid. In an aqueous solution it completely ionizes to give hydronium and sulphate ions the dissociation takes place in two steps:

$$H_2SO_{4(aq)} + H_2O_{(l)} \longrightarrow H_3O^+_{(l)} + HSO_4^-{}_{(aq)}$$

$$HSO_4^-{}_{(aq)} + H_2O_{(l)} \longrightarrow SO_4^{2-}{}_{(aq)} + H_3O^+_{(l)}$$

Topic No: 4.5.3: Uses of Sulphuric Acid:

52 Justify that H_2SO_4 is a king of chemicals?

Ans: H_2SO_4 has many applications in daily life, laboratories, industries etc. What's common to petrol, fertilizers, cars and soaps? They, like a lot of other things, require sulfuric acid to be made. That's why sulfuric acid is called the king of chemicals.

53 Write any four important uses of H_2SO_4? **(9 times)**

Ans: (i). it is used in manufacturing of fertilizers like ammonium sulphate and calcium superphosphate.

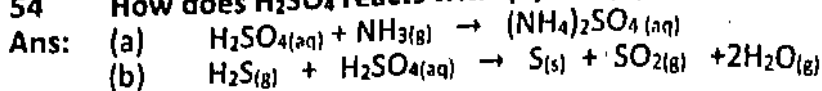
(ii). It is used in refining of petroleum to remove nitrogen and sulphur compounds.

(iii). It is used in manufacturing of HCl, H_3PO_4, HNO_3 and sulphates.

(iv). It is used in electrical batteries and storage cells.

54 How does H_2SO_4 reacts with (a) NH_3 (b) H_2S

Ans: (a) $H_2SO_{4(aq)} + NH_{3(g)} \rightarrow (NH_4)_2SO_{4(aq)}$

(b) $H_2S_{(g)} + H_2SO_{4(aq)} \rightarrow S_{(s)} + SO_{2(g)} + 2H_2O_{(g)}$

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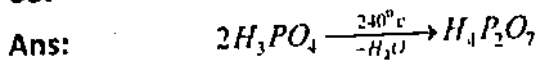
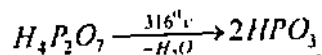
55. Write chemical equations showing effect of temperature on H_3PO_4.

Ans: $2H_3PO_4 \xrightarrow[-H_2O]{240^0c} H_4P_2O_7$

Phosphoric acid *Pyrophosphoric acid*

$H_4P_2O_7 \xrightarrow[-H_2O]{316^0c} 2HPO_3$

Pyrophosphoric acid *Metaphosphoric acid*

56. How temperature affects gaseous NO_2.

Ans: On cooling NO_2 is converted to a yellow liquid which can be frozen to N_2O_4. If this solid is heated to 140^0C the mixture contains NO_2 and N_2O_4 but above 140^0C, NO_2 is converted to NO and O_2.

$$N_2O_{4(l)} \xrightleftharpoons{140^0C} 2NO_2 \xrightleftharpoons{620^0c} 2NO + O_2$$

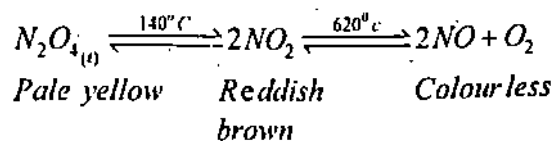
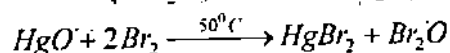
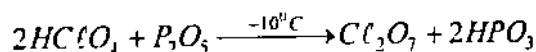
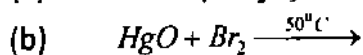
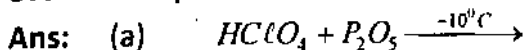
Pale yellow *Reddish brown* *Colour less*

57. Complete and balance following equations.

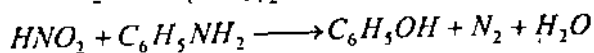
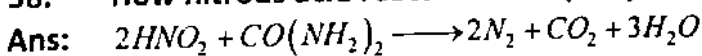
Ans: (a) $HC\ell O_4 + P_2O_5 \xrightarrow{-10^0C}$

(b) $HgO + Br_2 \xrightarrow{50^0C}$

$2HC\ell O_4 + P_2O_5 \xrightarrow{-10^0C} C\ell_2O_7 + 2HPO_3$

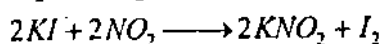
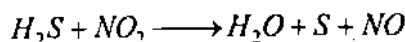
$HgO + 2Br_2 \xrightarrow{50^0C} HgBr_2 + Br_2O$

58. How nitrous acid reacts with $CO(NH_2)_2$ and $C_6H_5NH_2$.

Ans: $2HNO_2 + CO(NH_2)_2 \longrightarrow 2N_2 + CO_2 + 3H_2O$

$HNO_2 + C_6H_5NH_2 \longrightarrow C_6H_5OH + N_2 + H_2O$

59. Prove that NO_2 is strong oxidizing agent.

Ans: NO_2 oxidizes H_2S to Sulphur and KI to iodine.

$$H_2S + NO_2 \longrightarrow H_2O + S + NO$$

$$2KI + 2NO_2 \longrightarrow 2KNO_2 + I_2$$

These reactions prove that NO_2 is strongly oxidizing agent.

60. Write balanced chemical equations for reaction of H_3PO_4 with NaOH.

Ans: (i) $H_3PO_4 + NaOH \longrightarrow NaH_2PO_4 + H_2O$

(ii) $NaH_2PO_4 + NaOH \longrightarrow Na_2HPO_4 + H_2O$

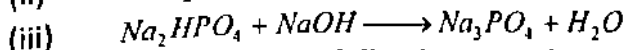
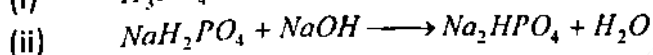
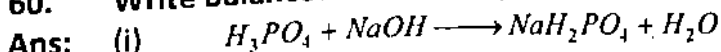
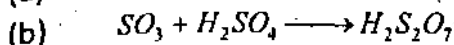
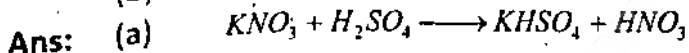
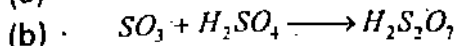
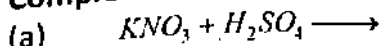
(iii) $Na_2HPO_4 + NaOH \longrightarrow Na_3PO_4 + H_2O$

61. Complete and balance following equations.

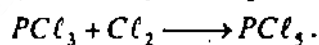
(a) $KNO_3 + H_2SO_4 \longrightarrow$

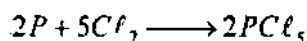
(b) $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$

Ans: (a) $KNO_3 + H_2SO_4 \longrightarrow KHSO_4 + HNO_3$

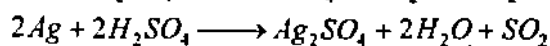
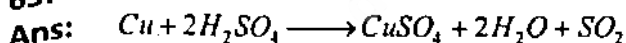
(b) $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$

62. Give two methods for preparation of $PC\ell_5$

Ans: (i) By passing dry chlorins gas through $PC\ell_3$

$$PC\ell_3 + C\ell_2 \longrightarrow PC\ell_5.$$

(ii) By passing chlorine in well cooled solution of phosphorous in CS_2.

$$2P + 5C\ell_2 \longrightarrow 2PC\ell_5$$

63. How hot conc. H_2SO_4 reacts with Cu and Ag metals.

Ans: $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + 2H_2O + SO_2$

$2Ag + 2H_2SO_4 \longrightarrow Ag_2SO_4 + 2H_2O + SO_2$

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64. Write the equation for the reaction between conc. H_2SO_4 and copper and explain what type of reaction Is It?

Ans: $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + 2H_2O + SO_2$

65. How Arsenic Is removed In contact process?

Ans: Arsenic oxide is then removed by passing the gases through a chamber provided with shelves packed with freshly prepared ferric hydroxide.

66. Describe the properties of White Phosphorus.

Ans: (i) White phosphorus is a very reactive, poisonous, volatile, waxy, yellowish white substance.

(ii) It is soluble in benzene and carbon disulphide.

(iii) It exists in the form of tetraatomic molecules (P4) which have a tetrahedral structure.

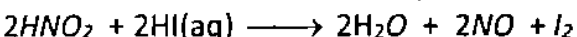
(iv) It boils at 280°C to P4 vapours which dissociate above 700°C to form P_2 molecules.

67. Complete the Balance the Equations: (a) $Cu + H_2SO_{4(conc)} \rightarrow$ (b) $Zn + H_2SO_{4(dil)} \rightarrow$

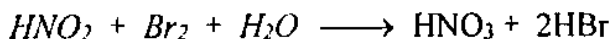
Ans: (a) $Cu + 2H_2SO_{4(conc)} \longrightarrow CuSO_4 + 2H_2O + SO_2$

(b) $Zn + H_2SO_{4(dil)} \longrightarrow ZnSO_4 + H_2O$

68. HNO_2 acts as Oxidizing as well as reducing agent. Give one reaction in each case.

Ans: **As an oxidizing:** It acts as an oxidizing agent and oxidizes HI, SO_2 and $SnCl_2$ into I_2, H_2SO_4 and $SnCl_4$, respectively.

$2HNO_2 + 2HI(aq) \longrightarrow 2H_2O + 2NO + I_2$

As a reducing agent: Nitrous acid decolourizes acidified $KMnO_4$ and bromine water. It readily gets oxidized to nitric acid, so it also behaves as a reducing agent.

$$HNO_2 + Br_2 + H_2O \longrightarrow HNO_3 + 2HBr$$

69. Phosphorus element can form five covalent bonds; nitrogen cannot, why?

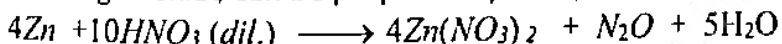
Ans: In phosphorus one of the 3s electrons can be promoted to a vacant 3d orbital giving 5 unpaired electrons in the valence shell. Phosphorus can thus make three or five covalent bonds.

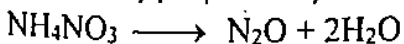
70. What is Laughing gas? How Is it prepared? Give one reaction.

Ans: Dinitrogen oxide is known as laughing gas.

Preparation

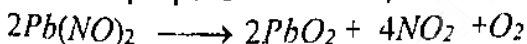
1. Dinitrogen oxide can be prepared by the action of dil, HNO_3, on metallic zinc.

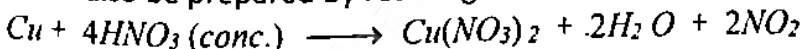
   $4Zn + 10HNO_3\,(dil.) \longrightarrow 4Zn(NO_3)_2 + N_2O + 5H_2O$

2. It is usually prepared by heating ammonium nitrate to about 200°C.

   $NH_4NO_3 \longrightarrow N_2O + 2H_2O$

71. Give two methods of preparation of NO_2.

Ans: Preparation

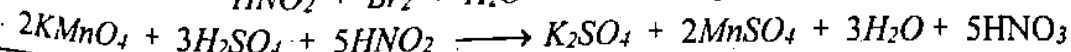
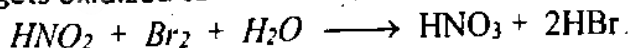
1. It can be prepared in small quantities by heating lead nitrate.

   $2Pb(NO)_2 \longrightarrow 2PbO_2 + 4NO_2 + O_2$

2. It can also be prepared by reacting conc. HNO3 with copper.

   $Cu + 4HNO_3\,(conc.) \longrightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$

72. Write two reactions which show reducing behavior of HNO_2.

Ans: **As a reducing agent:** Nitrous acid decolourizes acidified $KMnO_4$ and bromine water. It readily gets oxidized to nitric acid, so it also behaves as a reducing agent.

$$HNO_2 + Br_2 + H_2O \longrightarrow HNO_3 + 2HBr$$

$$2KMnO_4 + 3H_2SO_4 + 5HNO_2 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5HNO_3$$

CHAPTER NO:4 LONG QUESTIONS GROUP VA AND GROUP VIA ELEMENTS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 4.2.3/2

1 What happen when dil HNO_3 and conc. HNO_3 react with following? (3 Times)
(I) Cu (ii) Hg (iii) Sn (iv) Zn

Ans: (Text Book Page No:62)

2. Explain Birkeland and Eyde's process for preparation of HNO_3. (5 times)

Ans: (Text Book Page No:61)

3. How is nitric acid prepared industrially? Give all equations involved.

Ans: (Text Book Page No:61)

Topic No: 4.4.3

4. Describe eight points of similarities of oxygen with sulphur.

Ans: (Text Book Page No:69)

Topic No: 4.5

5. How sulphuric acid is manufactured by contact process on industrial scale? (4 Times)

Ans: (Text Book Page No:70)

2021

6. Write preparation and two reactions of HNO_2.
7. Write down four similarities and four differences between oxygen and sulphur.
8. H_2SO_4 is a dehydrating agent and oxidizing agent, prove this truth by giving two examples of each.
9. Discuss reactions of Sulphuric Acid as a Dehydrating Agent.
10. Write down two reactions in which HNO_2 acts as an oxidizing agent and two reactions in which HNO_2 acts as reducing agent.
11. Explain the cathode coating and anode coating of iron.

CHAPTER NO:5 OBJECTIVES (MCQ'S) HALOGENS AND THE NOBLE GASES IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 5.1: Introduction:

1. The element which causes burn to skin that heels slowly:
(a) F_2 (b) Cl_2 (c) Br_2 (d) Acidic

2- Melting points of halogens------ the group.
(A) Decrease down (B) Increase down
(C) Remain same throughout (D) First increase then decrease down

3.Which of the following statement is correct? (23 times)
(a) Bond energy of I_2 is less than Cl_2 (b) Bond energy of F_2 is less than I_2
(c) Bond energy of Cl_2 is less than F_2 (d) Bond energy of Cl_2 is less than I_2

4.Which halogen is used as an insecticide?
(a) Br_2 (b) I_2 (c) Cl_2 (d) F_2

5- Out of elements of group VII – A , the highest melting and boiling points is shown by element:
(a) F_2 (b) I_2 (c) Cl_2 (d) Br_2

6-Which one of halogens is a liquid?
(a) F_2 (b) Cl_2 (c) Br_2 (d) I_2

7- The radius of F^- ion is:
(a) 72pm (b) 133 pm (c) 99pm (d) 181pm

Topic No: 5.5.1: Hydrides;

8. Which halogen acid is the weakest acid in its aqueous solution: (3 times)
(a) HF (b) HCl (c) HBr (d) HI
9. Which of the following hydrogen halide is the weakest acid in solution? (12 times)
(a) HF (b) HCl (c) HBr (d) HI
10. Which of the following is the strongest acid in solution? (12 times)
(a) HF (b) HCl (c) HBr (d) HI
11- Hydrogen bond is strongest between the molecule of: (4 times)
(a) HI (b) HBr (c) HF (d) HCl
12. Which halogen occurs naturally in a positive oxidation state: (10 times)
(a) Florine (b) Chlrine (c) Bomine (d) Iodine

Topic No: 5.5.2: Oxides of Halogens:

13. ClO_2 react with H_2O to form: (2 times)
(a) HClO (b) $HClO_3$ (c) $HClO_4$ (d) Cl_2 and O_2
14. Bond angle in OF_2 is: (2 times)
(a) 150° (b) 120° (c) 107° (d) 105°
15. Iodine penta oxide (I_2O_5) is used for the quantitative analyses of:
(a) I_2 (b) CO (c) CO_2 (d) H_2S
16- Chlorine heptaoxide (Cl_2O_7) reacts with water to from: (5 times)
(a) Hypochlorous acid (b) Perchloric acid (c) Chloric acid (d) Chlorine and oxygen

Topic No: 5.5.4: Oxyacids:

17. The halogen that does not form oxyacids is:
(a) Fluorine (b) Chlorine (c) Bromine (d) Iodine
18. The anhydride of $HClO_4$ is: (10 times)
(a) ClO_3 (b) ClO (c) Cl_2O_5 (d) Cl_2O_7
19. Which one is perchloric acid:
(a) $HClO$ (b) $HClO_3$ (c) $HClO_2$ (d) $HClO_4$

Topic No: 5.5.5: Bleaching Powder:

20. Bleaching powder may be produced, by passing chlorine over: (3 times)
(a) Calcium carbonate (b) Hydrated calcium sulphate
(c) Anhydrous calcium sulphate (d) Calcium hydroxide

Topic No: 5.6: Commercial Uses of Halogens And Their Compounds:

21. Polymeric halides are formed by the elements.
(a) More electropositive (b) Less electropositive
(c) More electronegative (d) Less electronegative

Topic No: 5.7: Nobel Gases:

22- In nuclear reactors, the cooling medium is provided by:
(a) Helium (b) Neon (c) Xenon (d) Radon
23- Which of the following noble gas is used for arc welding and cutting:
(a) Helium (b) Argon (c) Xenon (d) Radon
24. Which of the following noble gas is used in bactericidal lamps?
(a) Ne (b) Ar (c) Kr (d) Xe
25. Which halogen will react spontaneously with Au(s) to produce Au^{3+}. (4 times)
(a) F_2 (b) Cl_2 (c) Br_2 (d) I_2
26- Hydrogen bonding is strongest among the molecule:
(a) HCl (b) HBr (c) HI (d) HF
27- Which one is the strongest acid: (5 times)
(a) HClO (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

2019

28. Weakest acidic solution wil be of:
(a) HF (b) HBr (c) HI (d) HCl

29. Catalyst used in contact process is:
(a) NO/NO_2 (b) Fe_2O_3 (c) SO_3 (d) V_2O_5

30. An element that has a high ionization energy and tends to be chemically inactive, would most likely to be:
(a) An alkali metal (b) A transition element (c) A noble gas (d) A halogen

2021

31. Which halogen is a solid at room temperature and pressure?
(a) F_2 (b) Cl_2 (c) Br_2 (d) I_2

32. Cl_2 cannot oxidize:
(a) F^- (b) Br^- (c) I^- (d) Na-metal

33. The halogen with the lowest melting and boiling points is
(a) fluorine (b) chlorine (c) bromine (d) iodine

34. Which halogen occurs naturally in a positive oxidation state? (3 Times)
(a) fluorine (b) chlorine (c) bromine (d) iodine

35. Which one is Chlorous Acid :
(a) HClO (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

36. Which of the following halogen is weak oxidizing agent?
(a) Cl_2 (b) F_2 (c) I_2 (d) Br_2

37. Which of the following represents the correct electronic configuration of the outer most energy level of an element of (VIIA) in the ground state?
(a) S^2P^2 (b) S^2P^4 (c) S^2P^5 (d) S^2P^6

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	B	A	C	B	C	B	A	A	D	C	D	B	D
15	16	17	18	19	20	21	22	23	24	25	26	27	28
B	B	A	D	D	D	B	A	B	D	B	D	D	A
29	30	31	32	33	34	35	36	37					
D	C	D	A	A	D	B	C	C					

CHAPTER NO:5 SHORT QUESTIONS HALOGENS AND THE NOBLE GASES IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 5.1: Introduction:

1 Arrange the following ions in order of increasing size F^-, Cl^-, Br^-, I^- (2 times)

Ans: $F^- < Cl^- < Br^- < I^-$

2 The elements of group VIII-A are called noble gases. Comment?

Ans: Elements of group VIII-A are called noble gases because, these elements are colourless, odourless monoatomic gases which are chemically un-reactive.

3 Why iodine has metallic luster? (6 times)

Ans: Due to big size of Iodine outer electrons are excited by taking light and due to excitation and de-excitation gives metallic luster.

4 Why the lattice energy of Fluorides is greater than Chlorides? (2 times).

Ans: Due to small size of fluoride ions (F^-), there will be a better overlap of orbitals and consequently leads to shorter and stronger bonds with other elements. Ionic fluorides have higher lattice energies than the chlorides and the value is responsible for the insolubility of the fluorides in water. Due to low dissociation energy of fluorine molecule, it is highly reactive. The other halogens react slowly under similar conditions. The fluorides are, however more stable with respect to dissociation into elements.

5 Give reason that fluorine is gas, iodine is solid.

Ans: Iodine molecule has larger size than fluorine. The intermolecular attraction is

greater in the larger molecules having greater masses. Due to the larger size of iodine molecule the van der Waal's forces are stronger than smaller size molecules of fluorine.

Topic No: 5.3: Peculiar Behaviour of Fluorine:

6 **What is peculiar behaviour of Fluorine?** (4 times)

Ans: It is due to small size of F atom and F^- ion, there will be better overlap of orbitals. Thus ionic fluorides have higher lattice energies than other halides and show low solubilities.

Topic No: 5.4: Oxidizing Properties:

7 **Compare halogen acids in their reducing properties?**

Ans: HF, HCl, HBr and HI act as reducing agents in the following order:

HF < HCl < HBr < HI

8 **Why Flourine acts as a strong oxidizing agent?**

Ans: Oxidizing power of fluorine is higher, because it has low energy of dissociation and higher hydration energy of its ions. Due to the relative strength as oxidizing agents, it is possible for each free halogen to oxidize the ions of other halogens next to it in the family. Fluorine can oxidize all the halide ions to molecular halogens.

9 **Halogens are strong oxidizing agents. Justify.** (5 times)

Ans: All the free halogens act as oxidizing agents when they react with metals or nonmetals. On forming ionic compounds with metals, the halogen s gain electrons and are converted to negative halide ions. $2Na + Cl_2 \rightarrow 2Na^+Cl^-$

The oxidizing power of halogens decreases with increase in atomic number.

10. **On what factors oxidizing power of halogens depends upon?** (8 times)

Ans: (i). Energy of dissociation.

(ii). Electron affinity of atoms.

(iii). Hydration energies of ions.

(iv). Heat of vapourization (Br_2 and I_2)

11. **Why oxidizing power of F_2 is higher than other halogens?**

Ans: Oxidizing power of F_2 is higher, because it has low energy of dissociation and higher hydration energy of its ions. Due to the relative strength as oxidizing agent it is possible for each free halogen to oxidize the ions of other halogens next to it in the family.

12 **Why oxidizing power of halogens decreases down the group?** (2 times)

Ans: Oxidizing power of halogens depends upon the following factors:

(i). Energy of dissociation.

(ii). Electron affinity of atoms.

(iii). Hydration energies of ions.

(iv). Heat of vapourization (Br_2 and I_2)

While going down the group, all above mentioned factors decreases. All the free halogens act as oxidizing agents when they react with metals or nonmetals. On forming ionic compounds with metals, the halogen s gain electrons and are converted to negative halide ions. $2Na + Cl_2 \rightarrow 2Na^+Cl^-$

The oxidizing power of halogens decreases with increase in atomic number.

Topic No: 5.5.1: Hydrides:

13 **Why HF is a weaker acid than other halogen acid?** (4 times)

Ans: Due to strong hydrogen bonding ionization of HF is less than other halogen acids. The hydrogen ion of HF is entrapped between two fluorine atoms from one side covalently bonded and from other side hydrogen bonded.

14 **HF is a weak acid while HCl is strong acid .Give reason.** (16 times)

Ans: The strength hydrogen halogen bond is very high in HF. The bond strength is reflected in the case of dissociation of hydrogen and halides. Hydrofluoric acid is a week acid due to limited ionization than hydrochloric acid.

15 **Write four properties of hydrogen fluoride?** (2 Times)

Ans: (i). HF is a colourless volatile liquid.

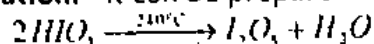
(ii). HF attacks glass and has found application as non-aqueous solvent.

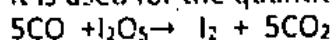
(iii). HF has melting point as -83.8ºC.
(iv). HF has boiling point as 19.5ºC.

Topic No: 5.5.2: Oxides of Halogens:

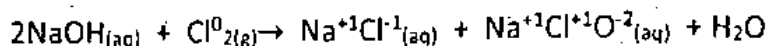
16 Give one method of preparation and one use of I_2O_5? **(2 Times)**

Ans: **Preparation:** It can be prepared by heating iodic acid at 240ºC.

$$2HIO_3 \xrightarrow{240^\circ C} I_2O_5 + H_2O$$

Use: It is used for the quantitative analysis of CO.

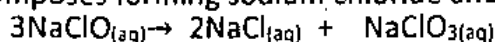
$$5CO + I_2O_5 \rightarrow I_2 + 5CO_2$$

Topic No: 5.5.3: Reactions of Chlorine with Cold and Hot NaOH:

17 Write down reaction of chlorine with cold & hot NaOH? **(10 times)**

Ans: (i). Chlorine will react with cold aq. NaOH at 15°C to form hypochlorite and a halide.

$$2NaOH_{(aq)} + Cl^0_{2(g)} \rightarrow Na^{+1}Cl^{-1}_{(aq)} + Na^{+1}Cl^{+1}O^{-2}_{(aq)} + H_2O$$

The reaction is disproportionation reaction, because the zero oxidation sate of chlorine atom in Cl_2 is converted to -1 in chloride and +1 in hypochlorite.

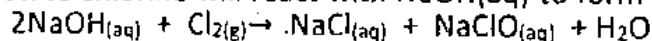
(ii). Sodium hypochlorite which is produced in cold state in the above reaction, decomposes forming sodium chloride and sodium chlorate at 70ºC.

$$3NaClO_{(aq)} \rightarrow 2NaCl_{(aq)} + NaClO_{3(aq)}$$

The reaction is again disproportionation reaction.

18 Discuss "disproportionation reaction" with an example? **(4 times)**

Ans: **Disproportionation reaction:** A reaction in which a species (molecule, atom or ion) is simultaneously oxidized and reduced is called **"disproportionation reaction"**.

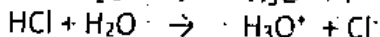
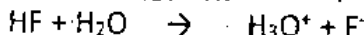
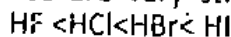
The reaction of chlorine with cold and hot NaOH are examples of "disproportionation reaction"

In cold (15ºC) state chlorine will react with NaOH(aq) to form hypochlorite and a halide. $2NaOH_{(aq)} + Cl_{2(g)} \rightarrow NaCl_{(aq)} + NaClO_{(aq)} + H_2O$

The reaction is disproportionation reaction, because the zero oxidation sate of chlorine atom in Cl_2 is converted to -1 in chloride and +1 in hypochlorite.

Topic No: 5.5.4: Oxyacids:

19 How Halogen acids are ionized in water? **(4 times)**

Ans: In water hydrogen halides give hydrofluoric, hydrochloric, hydrobromic and hydroiodic acids. Hydrofluoric acid is a week acid due to limited ionization. The other three acids are very strong acids. The acidic strength increases in the order. HF <HCl<HBr< HI

$$HF + H_2O \rightarrow H_3O^+ + F^-$$
$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

20 Arrange following oxyacids in increasing order of acid strength and oxidizing power ; $HClO_4 > HClO_2 > HClO$ **(3 times)**

Ans: $HClO_4 > HClO_2 > HClO$

21 Give the names and formulae of oxyacids of chlorine? **(2 Times)**

Ans:

Name	Formulae
Hypochlorous acid	$HClO$
Chlorous acid	$HClO_2$
Chloric acid	$HClO_3$
Perchloric acid	$HClO_4$

22 HXO_4 is strongest oxyacid. Explain **(2 times)**

Ans: The acidic strength increases with the increase in the number of oxygen atoms. As the oxidation state of the halogen increases, the bonding electrons are shifted away from the H-atom and the tendency of the molecule to lose a proton increases. This accounts for the change of strength of oxyacids. HXO_4 has four oxygen atoms, so it is strongest oxyacid.

23 Describe factor of acidic strength of oxyacids of halogens?

Ans: (i). Number of oxygen atoms attached to the oxyacid of halogens.
(ii). Oxidation state of hydrogen in oxyacid of halogens.
(iii). Tendency to lose proton from oxyacid of halogens.
(iv). The acidic strength increases in the order.

$HClO < HClO_2 < HClO_3 < HClO_4$

24 Write formulas of two Oxides of Bromine.

Ans:

	Name	Formula
1.	Bromine monoxide	Br_2O
2.	Bromine dioxide	BrO_2
3.	Bromine trioxide	BrO_3 (Br_3O_6)

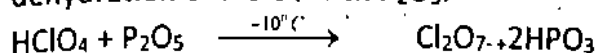
25 Perchloric acid is considered as valuable analytical reagent. Why?

Ans: Due to oxidizing effect of perchloric acid it is considered as valuable analytical reagent.

26 Justify that Cl_2O_7 is the anhydride of perchloric acid? / Prepare Cl_2O_7 with the help of chemical reaction. **(2 times)**

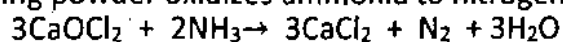
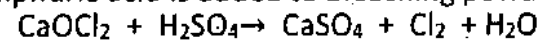
Ans: <u>Cl_2O_7 is an anhydride:</u>

Cl_2O_7 is the anhydride of perchloricacid, it can be obtained at -10°C by dehydration of $HClO_4$ with P_2O_5.

$$HClO_4 + P_2O_5 \xrightarrow{-10^\circ C} Cl_2O_7 + 2HPO_3$$

Topic No: 5.5.5: Bleaching Powder:

27 How bleaching powder reacts with (1) Ammonia (2) excess of H_2SO_4 **(3 times)**

Ans: (i). Bleaching powder oxidizes ammonia to nitrogen:

$$3CaOCl_2 + 2NH_3 \rightarrow 3CaCl_2 + N_2 + 3H_2O$$

(ii). If access of sulphuric acid is added to bleaching powder, chlorine is given out $CaOCl_2 + H_2SO_4 \rightarrow CaSO_4 + Cl_2 + H_2O$

28 How bleaching powder is prepared by Hasenclever,s method? (2 times)

Ans: The apparatus used in this method consist of 4 to 8 iron cylinders placed one above the other horizontally. They are interconnected and provided with stirrers. The slaked lime is added in through a hopper in the upper cylinder and is transported from one cylinder to the other with rotating stirrers. Chlorine introduced into the lowest cylinder rises up and reacts with slaked lime to form bleaching powder, which is collected through the outlet in the lower cylinder.

29 Write four uses of bleaching powder? **(7 times)**

Ans: Bleaching powder is used:

(i). for the laboratory preparation of chlorine and oxygen. It is also used in the manufacture of chloroform.

(ii). as a disinfectant and in the sterilization of water.

(iii). for making unshrinkable wool.

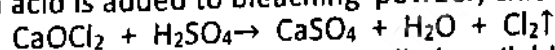
(iv). for bleaching cotton, linen and paper pulp. (delicate fabrics like wool, silk etc. can not be bleached with it as these could be damaged by chlorine)

30 What is bleaching powder?

Ans: <u>Bleaching powder:</u> It is chemically $CaOCl_2$. Bleaching powder is a yellowish white powder with strong smell of chlorine, and is used to bleach different things. It has free chlorine known as "available chlorine", which is a main component of bleaching powder as bleaching agent.

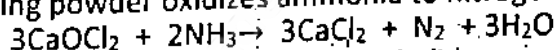
31 What is meant by available chlorine? **(4 times)**

Ans: If excess of an acid is added to bleaching powder, chlorine is given out.

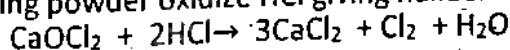
$$CaOCl_2 + H_2SO_4 \rightarrow CaSO_4 + H_2O + Cl_2\uparrow$$

The amount of chlorine thus set free is called available chlorine. The activity of bleaching powder is measured in terms of available chlorine. The average percentage of available chlorine in bleaching powder is 35-40 percent.

32 Write Chemical reactions of Bleaching Powder ($CaOCl_2$) with HCl and NH_3. (4 times)

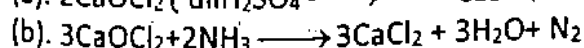
Ans: (i). Bleaching powder oxidizes ammonia to nitrogen:

$$3CaOCl_2 + 2NH_3 \rightarrow 3CaCl_2 + N_2 + 3H_2O$$

(ii). Bleaching powder oxidize HCl giving halide.

$$CaOCl_2 + 2HCl \rightarrow 3CaCl_2 + Cl_2 + H_2O$$

33 Complete the following reactions. **(2 times)**

$CaOCl_2$+ dil $H_2SO_4 \rightarrow$? (b) $CaOCl_2+NH_3$

Ans: (a). $2CaOCl_2 + dilH_2SO_4 \longrightarrow CaSO_4 + CaCl_2 + 2HClO$

(b). $3CaOCl_2 + 2NH_3 \longrightarrow 3CaCl_2 + 3H_2O + N_2$

Topic No: 5.6: Commercial Uses of Halogens and Their Compounds:

34 Write four uses of halogen? **(2 times)**

Ans: (i). Fluorine is used for the preparation of freons. Which is being used in refrigerants and aerosol propellants.

(ii). Fluorine is used to prepare Teflon $(-CF_2-CF_2-)_n$.

(iii). Chlorine is used in the manufacturing of bleaching powder, polyvinyl chloride, chloroform and carbon tetrachloride.

(iv). Iodine is used in pharmaceutical industries as disinfectant and germicide.

35 What are freons and Teflons? **(14 times)**

Ans: **Freons:** Fluorine is used for the preparation of freons. Freon is the commercial name of low molecular mass fluorochlorocarbns, CCl_2F_2, $CClF_3$. These are being used as refrigerants and aerosol propellants.

Teflons: Fluorine is used for the preparation of Teflon $(-CF_2-CF_2-)_n$. It is polymerized tetrafluoro ethylene compound. It is a valuable plastic which resists the action of oxidants, acids and alkalies. Corrosion proof parts of machinery are made of it. It is used for coating the electrical wiring. Teflon is also used as a non-stick coating for cooking pans.

36 What are Freons ? Give their uses. **(2 times)**

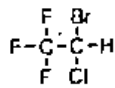
Ans: **Freons:** Fluorine is used for the preparation of freons. Freon is the commercial name of low molecular mass fluorochlorocarbns, CCl_2F_2, $CClF_3$. These are being used as refrigerants and aerosol propellants.

37 What is Teflon? Give two uses also? **(4 times)**

Ans: **Teflons:** Fluorine is used for the preparation of Teflon $(-CF_2-CF_2-)_n$. It is polymerized tetrafluoro ethylene compound. It is a valuable plastic which resists the action of oxidants, acids and alkalies. Corrosion proof parts of machinery are made of it. It is used for coating the electrical wiring. Teflon is also used as a non-stick coating for cooking pans.

38 What is Halothane? What is formula. Give its uses. **(2 times)**

Ans: **Definition:** Chemical compounds of halogens with ethylene is called halothane.

```
   F  Br
   |  |
F—C—C—H
   |  |
   F  Cl
```

it is used as anesthetic agent.

Formula: Flourine is used to form Teflon $(-CF_2-CF_2-)_n$.

Uses: Teflon is valuable plastic which resist the action of oxidants, acids and alkalies. Corrosion-proof parts of machinery are made of it. It is used for coating the electrical wiring. Teflon is also used in non stick coating for cooking pans. Halothane used as an anaesthetic.

39 Give uses of Iodine. **(2 times)**

Ans: The major applications of iodine are in pharmaceutical industry. It is used as disinfectants and germicides. Tincture of iodine and iodex are popular preparations of iodine. Diet with insufficient iodine ions leads to an enlargement of the thyroid (Goiter). To ensure the present of iodide ion in the diet, sodium or potassium iodide is added to the common salt which is known as iodized salt.

40 What is iodize salt? **(7 times)**

Ans: **Iodize salt:** When sodium or potassium iodide is added to the common salt, then the common salt is called iodized salt.

41 What are the commercial uses of halogens and their compounds?

Ans: (i). Fluorine is used for the preparation of freons. Which is being used in refrigerants and aerosol propellants.

(ii). Fluorine is used to prepare Teflon $(-CF_2-CF_2-)$.

(iii). Chlorine is used in the manufacturing of bleaching powder, polyvinyl chloride, chloroform and carbon tetrachloride.

(iv). Iodine is used in pharmaceutical industries as disinfectants and germicides.

42 Give two uses of bromine?

Ans: **Uses of bromine:**

Ethylene dibromideis added to leaded gasoline to save the engine from lead oxide and lead sulphate deposits. Bromine is also used as fungicide. Silver bromide is used in photography.

Topic No: 5.7: Nobel Gases:

43 Write name and symbol of an element from p-block that has zero oxidation state. Also write its electronic configuration.

Ans: **Name and symbol of an element from p-block that has zero oxidation state:**

Name of element	Symbols	Electronic Configuration
Neon	Ne(8)	$1s^2,2s^2,2p^6$
Argon	Ar(18)	$1s^2,2s^2,2p^6,3s^2,3p^6$
Krypton	Kr(36)	$[Ar],4s^2,3d^{10},4p^6$

44 What are noble gases? Why are they inert?

Ans: **Noble gases:** Elements of group VIII-A are called noble gases because, these elements are colourless odourless monoatomic gases which are chemically un-reactive.

Noble gases are inert due to the completion of their outer most shell. These gasés have complete electronic configuration and have filled duplet and octet.

45 Write any four applications of noble gases? (6 times)

Ans: (i). Helium is used in weather balloons, in welding and in traffic signal light.
(ii). Helium is used as a cooling medium for nuclear reactors.
(iii). Neon and helium arc is used in making glass lasers.
(iv). Argon is used for arc welding and cutting.
(v). Xenon is used in bactericidal lamps.

46 What are the major applications of Neon?

Ans: Neon is largely used in making neon advertising signs, in high voltage indicators and TV tubes. Neon and helium arc is used in making glass lasers.

47 Write any two uses of krypton.

Ans: Krypton is used to fill fluorescent tubes and in flash lamps for high speed photography.

48 Give two applications of Radon gas.

Ans: (i). Radon being radioactive is used in earth quake prediction.
(ii). Radon being radioactive is used in radiotherapy for cancer.

49 Complete and Balance the Equations $XeF_4 + NH_3 \Rightarrow ?$(b) $XeF_4 + Hg \Rightarrow ?$(2 times)

Ans: (a) $3XeF_4 + 4NH_3 \longrightarrow 3Xe + 12HF + 2N_2$

(b) $XeF_4 + 2Hg \longrightarrow Xe + 2HgF_2$

50 Give two reactions for the preparation of XeO_4.

Ans: $Ba_2XeO_6 + 2H_2SO_4 \longrightarrow XeO_4 + 2BaSO_4 + 2H_2O$

$Na_4XeO_6 + 2H_2SO_4 \longrightarrow XeO_4 + 2Na_2SO_4 + 2H_2O$

51 Give any two uses of helium.

Ans: (i). Helium is used in weather balloons, in welding and in traffic signal light.
(ii). Helium is used as a cooling medium for nuclear reactors.

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52. Which Halogen sublimes to violet vapours.

Ans: Iodine sublimes to violet vapours.

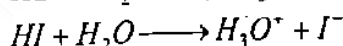
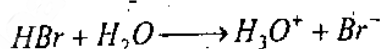
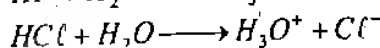
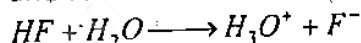
53. How are the Halogen acids ionized in waters.

Ans: Halogen acids ionize in water and form halide ions and hydronium ions. e.g;

$$HF + H_2O \longrightarrow H_3O^+ + F^-$$

$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$

$$HBr + H_2O \longrightarrow H_3O^+ + Br^-$$

$$HI + H_2O \longrightarrow H_3O^+ + I^-$$

54. Describe the chemical reactions of bleaching powder with (a) HI (b) CO_2.

Ans: (a) $CaOCl_2 + 2HI \longrightarrow CaCl_2 + H_2O + I_2$

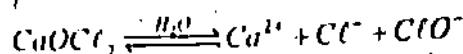
(b) $CaOCl_2 + CO_2 \longrightarrow CaCO_3 + Cl_2$

55. How does fluorine differs from other halogens?

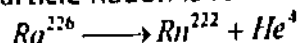
Ans: Fluorine differs from other halogens because.

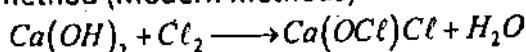
(I) F atom has small size ionic flourides have high lattice energies than other halides.
(II) Fluorine is only halogen which directly reacts with nobel gases like Kr, Xe, Rn forming their fluorides.

56. The bleaching action of bleaching powder is due to its oxidative character. Justify it.
Ans: Bleaching powder is an oxidizing agent. This property is due to generation of hypochlorite ion (OCl^-) in water.

$$CaOCl_2 \xrightleftharpoons{H_2O} Ca^{2+} + Cl^- + ClO^-$$

It can oxidizes and bleaches cotton, linen and paper pulp.

57. How is Radon formed from radium. Give equation.
Ans: When Radium emits an α – particle Radon is formed.

$$Ra^{226} \longrightarrow Rn^{222} + He^4$$

58. Name any two methods for manufacture of Bleaching powder. Also give reaction for this. **(2 Times)**
Ans: (a) Hesenclever's method (old method)
(b) Beckmann's method (Modern methods)

$$Ca(OH)_2 + Cl_2 \longrightarrow Ca(OCl)Cl + H_2O$$

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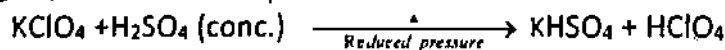
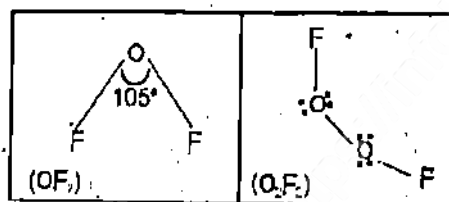
59. Give reactions of bleaching powder with ammonia and carbon dioxide.
Ans: Reaction with Ammonia: $3CaOCl_2 + 2NH_3 \longrightarrow 3CaCl_2 + 3H_2O + N_2$
Reaction with Carbon dioxide $CaOCl_2 + CO_2 \longrightarrow CaCO_3 + Cl_2$

60. Write names of these compounds. (a) $NaClO_3$ (b) HIO_3
Ans:(a) $NaClO_3$ **: Sodium chlorate**
(b) HIO_3 **: Iodic acid**

61. Prepare $HClO_4$. Also write down its two properties.
Ans: Prepartaion perchloric acid ($HClO_4$)
Perchloric acid ($HClO_4$) is commonly obtained in aqueous solution. Pure anhydrous compound can by prepared by distilling a mixture of potassium perchlorate ($KClO_4$) and conc. H_2SO_4 under reduced pressure.

$$KClO_4 + H_2SO_4 \text{ (conc.)} \xrightarrow[\text{Reduced pressure}]{\Delta} KHSO_4 + HClO_4$$

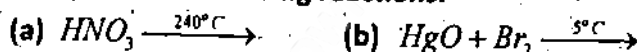
Properties:
(i). Perchloric acid is a colourless hygroscopic liquid.
(ii) At normal pressure it freezes at -112°C and boils with decomposition at 90° C.

62. Draw Structural formula of OF_2 and O_2F_2.
Ans:

Structures of OF_2 and O_2F_2

63. What is the oxidation state of chlorine in $HClO_4$ and $HClO$?
Ans: (a) O.S of Cl in $HClO_4$ = +7 ,
(b) O.S of Cl in $HClO$ = +1 ,

64. How are HF and HCl prepared?
Ans: $H_2 + F_2 \xrightarrow[\text{state}]{\text{dark and cold}} 2HF$

$H_2 + Cl_2 \xrightarrow{\text{sunlight}} 2HCl$

65. Complete the following reactions:
(a) $HNO_3 \xrightarrow{240°C}$ **(b)** $HgO + Br_2 \xrightarrow{5°C}$

Ans: **(a)** $HNO_3 \xrightarrow{240°C} I_2O_5 + H_2O$
(b) $HgO + Br_2 \xrightarrow{5°C} HgBr_2 + Br_2O$

66. **Write down four physical properties of $HClO_4$.**

Ans: **Properties:**

(i) Perchloric acid is a colourless hygroscopic liquid.

(ii) At normal pressure it freezes at -112°C and boils with decomposition at 90° C.

(iii) In the cold and dilute state,perchloric acid is a very weak oxidizing agent but when hot and concentrated its oxidizing power is enhanced.

(iv) Dissolving power of perchloric acid is enhanced due to its oxidizing strength.

(v) Perchloric acid is the strongest of all the acids in an aqueous medium.

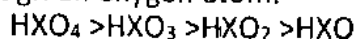
67. **Compare the physical states and colours of halogens at room temperature.**

Ans:

Properties	Fluorine	Chlorine	Bromine	Iodine
Physical state and colour	Pale Yellow gas	Greenish yellow gas	Red brown liquid	Shiny greyish solid

68. How does oxidation state of halogen affect the acidic strength of oxyacids of halogen?

Ans: The acid strength increases with the increase in the number of oxygen atoms. As the oxidation state of the halogen increases, the bonding electrons are shifted away from the Hatom and the tendency of the molecule to lose a proton increases. This accounts for the change of strength of oxyacids. The oxyacids of halogens show their strength in the order given below: An oxyacid molecule contains hydrogen linked to the halogen through an oxygen atom.

$$HXO_4 > HXO_3 > HXO_2 > HXO$$

The oxyacids of chlorine are stronger than the corresponding oxyacids of bromine which are, in turn, stronger than the corresponding oxyacids of iodine. It is due to decrease in the electronegativity and increase in the size of the halogen.

CHAPTER NO:5 LONG QUESTIONS HALOGENS AND THE NOBLE GASES IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 5.3

1. **Explain peculiar behaviour of fluorine.** **(4 times)**

Ans: (Text Book Page No:81)

Topic No: 5.4

2. **Discuss Relative Reactivities of the Halogens as Oxidizing Agent.**

Ans: (Text Book Page No:81)

Topic No: 5.5.4

3. **Give rules for nomenclature of oxyacids of halogens.**

Ans: (Text Book Page No:84)

Topic No: 5.5.5

4. **What is Bleaching Powder? How is it prepared commercially?**

Ans: (Text Book Page No:88)

5. **How bleaching powder is prepared? Give its uses.**

Ans: (Text Book Page No:88)

6. **How does bleaching powder reacts with(i)NH_3 (ii) HCl (iii) H_2O (iv) dilH_2SO_4?**

Ans: (Text Book Page No:89)

7. **Write down reactions of $CaOCl_2$with (i) CO_2 (ii) HCl (iii) NH_3 (iv) H_2SO_4**

Ans: (Text Book Page No:89)

8. **How bleaching powder is prepared by Hasenclever'smethod? Give its reaction with HCl and NH_3.**

Ans: (Text Book Page No:88)

9. **What happened when bleaching powder reacts with :**

(a) dil. H_2SO_4 (b) conc. H_2SO_4 (c) NH_3 (d) HI

Ans: (Text Book Page No:89)

Topic No: 5.6

10. Write the Commercial uses of Flourine, Chlorine and their compounds.

Ans: (Text Book Page No:89)

Topic No: 5.7

(2 times)

11. Write chemical reactions of Fluorides of Xenon.

Ans: (Text Book Page No:92) (3 times)

12. Give eight uses of noble gases.

Ans: (Text Book Page No:93)

13. Give two applications of each (i) Helium (ii) Argon

Ans: (Text Book Page No:93)

14. Write uses of neon and argon.

Ans: (Text Book Page No:93)

CHAPTER NO:6 OBJECTIVES (MCQ'S) TRANSITION ELEMENTS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 6.1: Introduction:

1. Which is transition element?

(a) Ba (b) Na (c) Ra (d) Co

Topic No: 6.1.1: Typical and Non Typical Transition Elements:

(6 times)

2.GroupVIB of transition element contains:

(a) Zn, Cd, Hg (b) Cr, Mo, W (c) Mg, Co, V (d) Zn, Fe, W

(13 times)

3.Typical transition element is:

(a)Sc (b) Co (c)Ra (d) Y

(2 times)

4- Total number of d-block elements(transition metals) are:

(a) 10 (b) 20 (c) 30 (d) 40

Topic No: 6.2.1: General Characteristics:

5. One of the following properties of transition elements does not vary with a regular pattern. Indicate that:

(a)Binding energy (b)Melting point (c)Covalent radius (d) All of them

(9 times)

6.The colour of transition metal complexes is due to:

(a)d-d transitions of electrons (b) Paramagnetic nature of transition elements

(c) Ionization (d)Loss of s-electrons

7.The strength of binding energy of transition elements depends upon: (9 times)

(a)Number of electron pairs (b) Number of unpaired electrons

(c)Number of neutrons (d)Number of protons

8.Which of the following has greatest number of unpaired electrons?

(a) Fe (b) Fe^{+2} (c) Mn^{+2} (d) Cr^{+3}

9.Which one shows paramagnetic behaviour?

(a)Fe^{3+} (b) Zn^{2+} (c)Cd^{2+} (d)Sc^{3+}

(4 times)

10- Which element form an ion with charge +3:

(a) Chromium (b) Copper (c) Lead (d) Zinc

Topic No: 6.3.1: Complex Compounds:

(2 times)

11.The coordination number of Cu in $[Cu(NH_3)_4]SO_4$:

(a)Zero (b) Two (c)Four (d)Six

12.Coordination number of 'Fe' in $K_4[Fe(CN)_6]$:

(a) 6 (b) 4 (c) 3 (d) 2

Topic No: 6.3.3: Nomenclature:

13. Coordination number of 'Pt' in $[PtCl(NO_2)(NH_3)_4]^{2+}$; (12 times)

(a) 2- (b) 4 (c) 1 (d) 6

Topic No: 6.3.4: Geometry of Complexes:

14. Which set of hybrid orbitals produces octahedral geometry?

(a) dsp^3 (b) sp^3d^2 (c)dsp^2 (d) sp^3

Topic No: 6.4: Iron:

15- Which metal is used in thermite process:

(a) Iron (b) Copper (c) Aluminium (d) Zinc

16- The percentage of Carbon in different types of Iron Products is in the order of: (2 times)

(A) Cast Iron > Wrought Iron > Steel (B) Wrought Iron > Steel > Cast Iron
(C) Cast Iron > Steel > Wrought Iron (D) Cast Iron = Steel > Wrought Iron

Topic No: 6.4.1: Commercial Forms of Iron:

17. Percentage of carbon in steel is:

(a) 0.25 to 2.5% (b) 0.12 to 20% (c) 3.00 to 4.5% (d) 2.0 to 4.5%

Topic No: 6.4.4: Steel:

18- Mild steel contains carbon percentage:

(a) 0.1 – 0.2% (b) 0.3 - 0.7% (c) 0.7 – 1.5 % (d) 1.6 – 2.0 %

19. Which of the following is a non-typical transition element? (8 times)

(a) Cr (b) Mn (c) Zn (d) Fe

20. The chemical formula of chromyl chloride is:

(a) $CrCl_2$ (b) CrO_2Cl_2 (c) CrO_2Cl_3 (d) $Cr_2O_3Cl_2$

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21. Formula of Haematite is:

(a) FeS_2 (b) Fe_2O_3 (c) $FeCO_3$ (d) Fe_3O_4

22. Maximum number of unpaired electrons are in cation:

(a) Ni^{2+} (b) CO^{2+} (c) Mn^{2+} (d) Fe^{2+}

23. Maximum No. of unpaired electrons are in: (2 Times)

(a) O_2 (b) O_2^+ (c) O_2^{2+} (d) O_2^{2-}

24. Which one is non – typical transition element: (3 Times)

(a) Cr (b) Mn (c) Zn (d) Fe

25. The total number of transition elements is: (2 Times)

(a) 10 (b) 14 (c) 40 (d) 58

26. Oxidation state of Cu in $K_2[Cu(CN)_4]$ is:

(a) +4 (b) +3 (c) +2 (d) +6

2021

27. The colour of $\left[Ti(H_2O)_6\right]^{3+}$ ion is:

(a) Red (b) Yellow (c) Violet (d) Green

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	B	B	C	D	A	B	C	A	A	C	A	D	B	C
16	17	18	19	20	21	22	23	24	25	26	27			
C	A	A	C	B	B	C	A	C	D	C	C			

CHAPTER NO:6 TRANSITION ELEMENTS SHORT QUESTIONS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 6.1: Introduction:

1 **What are the typical and non-typical transition elements?** (3 times)

Ans: In order to maintain a rational classification, the elements of group IIB (Zn, Cd, Hg) and group IIIB (Sc, Y, Ca) are referred to as non-typical transition elements and the elements in the remaining transition series are called typical transition elements.

Topic No: 6.1.1: Typical and Non Typical Transition:

2. **Why d-block and f-block elements are called transition elements?** (5 times)

Ans: d-block and f-block elements are called transition elements because they are located between the s and p – block elements and their properties are in transition between the metallic elements of the s-block and nonmetallic elements of the p- block.

Topic No: 6.2.1: General Characteristics:

3 Give four important characteristics of Transition Elements? / Mention any four properties of transition elements. (4 times)

Ans: (i). Melting and boiling points: Transition metals have very high melting and boiling points due to strong binding forces present between their atoms.

(ii). Binding Energy:Transition metals are tough, malleable and ductile. The toughness of these metals indicate strong metallic binding. This is because, apart from s electrons of the outer most shell, the electrons of underlying half-filled d-orbitals also participate in binding.

(iii). Oxidation state:Transition metals exhibit variable valency or oxidation state. They show variable valencies because of the involvement of the unpaired d-electrons to s-electrons in bond formation.

(vi). ColourIn transition elements, the d-orbitals are responsible for the colour development in their compounds. When these orbitals are involved in bonding, they split up into two energy levels, one set has a higher energy than the other. The electrons residing in low energy d-orbitals absorb a part of the visible light and jump to high energy d-orbitals. This process is called d-d transition.

4 What is the cause of paramagnetic behaviour? (2 Times)

Ans: Paramagnetic behaviour is caused by the presence of unpaired electrons in an atom, molecule or ion because there is a magnetic moment associated with the spinning electron. It increases with the increase in the number of unpaired electrons.

5. What are Paramagnetic and Diamagnetic substances? (3 times)

Ans: Substances which are weakly attracted by a strong magnetic field are called paramagnetic substances.

Those substances which are weakly repelled by a strong magnetic field are called diamagnetic substances.

6 What are interstitial compounds? (8 times)

Ans: Interstitial compounds:-When small non-metal atoms like H,B, C and N enter the interstices of transition metals and impart useful features to them, they are called Interstitial compounds. These are non-stoichiometric compounds. Sometimes they are also termed as interstitial alloys.

7 What type of elements form substitution alloy and why? (2 times)

Ans: Owing to the similarty in the sizes of transition metals, some transition metal atoms are able to replace one another in the metallic lattice and form substitutional alloys among themselves. Alloy steels are important example of this type of material in which iron atoms are substituted by chromium, manganese and nickel atoms etc. to give the steel more useful properties. Other examples are brass, coinage alloys etc.

8. Why Transition metals show variable valencies (oxidation states)? / What is variable oxidation state? Why the transition elements show variable valency or oxidation state? (9 times)

Ans: Transition metals exhibit variable valencies or oxidation states. They show variable valencies because of the involvement of the unpaired d electrons to s electrons in bond formation.

9 Give reason for the development of colours in the transition complexes? (8 times)

Ans: In transition elements, the d-orbitals are responsible for the colour development in their compounds. When these orbitals are involved in bonding, they split up into two energy levels, one set has a higher energy than the other. The electrons residing in low energy d-orbitals absorb a part of the visible light and jump to high energy d-orbitals. This process is called d-d transition.

10 Explain d-d transition?

Ans: **d-d transition:-**When d orbitals are involved in bonding, they split up into two energy levels, one set has a higher energy than the other. The electrons residing in low energy d orbitals absorb a part of the visible light and jump to high energy d orbitals. This process is called d-d transition.

11 What is d-d transition explain it with respect to $[Ti(H_2O)_6]^{3+}$ (3 Times)

Ans: **d-d transition:-**When d orbitals are involved in bonding, they split up into two energy levels, one set has a higher energy than the other. The electrons residing in low energy d-orbitals absorb a part of the visible light and jump to high energy d-orbitals. This process is called d-d transition.

Explanation: In $[Ti(H_2O)_6]^{3+}$, yellow light is absorbed, while most of the blue and red lights are transmitted, therefore the solution of $[Ti(H_2O)_6]^{3+}$ ions looks violet in colour.

12 Define substitutional alloy? Give an example. (2 Times)

Ans: **Substitutional alloy:** Due to the similarity in the sizes of transition metals, some transition metal atoms are able to replace one another in the metallic lattice and form substitutional alloys among themselves. Alloy of steels are an important example of this type of material in which iron atoms are substituted by chromium, manganese and nickel atoms, etc. to give steel more useful properties.

13. Define paramagnetism? Which two transition metal ions have strongest paramagnetic behaviour.

Ans: **Paramagnetism:**
The substances which are weakly attracted by a strong magnetic field are called paramagnetic substances and phenomenon is called paramagnetism . For example Fe^{3+} and Mn^{2+}.

14. Give reason that M.P and B.P show maximum value of the middle of 1st transition series.

Ans: M.P and B.P show maximum value of the middle of 1st transition series and then decrease to a minimum level at the end of the series. This trend in M.P correlates well with the strength of binding force.

Topic No: 6.3.1: Components of Complex Compounds:

15. Give coordination number and oxidation state of Fe in $K_4[Fe(CN)_6]$?

Ans: Coordination number of Fe in $K_4[Fe(CN)_6]$ is 6.
Oxidation state of Fe in $K_4[Fe(CN)_6]$ is +2.

16. Define central metal atom or ion? (2 times)

Ans: A metal atom or ion (usually a transition element) surrounded by a number of ligands is called a central metal atom or ion eg in $K_2[Cu(CN_4)]$, Cu^{+2} is the central metal ion.

17. Write down the reaction of $KMnO_4$ with (i) H_2S (ii) KOH

Ans: **Reaction of $KMnO_4$ with H_2S:** It oxidizes H_2S to sulphur.

$$2KMnO_4 + 3H_2SO_4 + 5H_2S \rightarrow K_2SO_4 + 2MnSO_4 + 5S + 8H_2O$$

Reaction of $KMnO_4$ with KOH:
When an alkaline solution of $KMnO_4$ is heated with KOH, O_2 is evolved.

$$4KMnO_4 + 4KOH \rightarrow 4K_2MnO_4 + 2H_2O + O_2$$

18. Define Ligand? Give two examples. (2 times)

Ans: **Ligand:-**The atom or ion or neutral molecules, which surround the central metal ion and donate electron pairs to it, are called ligands. They may be anions or neutral molecules.

Examples: (i). In $K_4[Fe(CN)_4]$, CN^- is an anionic ligand.
(ii). In $[Ag(NH_3)_2]Cl$, NH_3 is a neutral ligand.

19. What do you mean by Ligand and Coordination sphere? (3 times)

Ans: **Ligands:**The atoms or ions or neutral molecules, which surround the central metal atom ion and donate electron pairs to it, are called ligands. They may be anions or neutral molecules e.g. $K_4[Fe(CN)_6]$.
In this example CN^- is anionic ligand. Ligand having two donor aotms are called bidentate ligands. e.g.

Oxalate anion $\begin{array}{c} COO^- \\ | \\ COO^- \end{array}$ is a bidentate ligand and its coordination with the metal ion occurs through its both negatively charged oxygen atoms.

Coordination sphere: The central metal atom or ion along with ligand is called the coordination sphere. It is usually placed in square brackets. It may be anionic, cationic or neutral e.g. $K_4[Fe(CN)_6]$.

20. What is ligand? Give types of ligands? **(2 times)**

Ans: **Ligand and its types:**

Ligands: The atoms or ions or neutral molecules, which surround the central metal atom ion and donate electron pairs to it, are called ligands.

Types: They may be anions or neutral molecules e.g. $K_4[Fe(CN)_6]$ and $[Ag(NH_3)_2]Cl$. In these examples CN^- is anionic ligand while NH_3 is neutral ligand. According to donation of lone pair these are classified as monodentate, bidentate, tridentate and poly dentate. For example

Ligand having two donor aotms are called bidentate ligands. e.g.

Oxalate anion $\begin{array}{c} COO^- \\ | \\ COO^- \end{array}$ is a bidentate ligand and its coordination with the metal ion occurs through its both negatively charged oxygen atoms.

21. Define coordination number and give two examples? **(3 times)**

Ans: **Coordination number:-** The number of lone pair of electrons provided by the ligand to the central metal atom or ion is called the coordination number of the central metal atom or ion.

Example: Coordination number of Fe^{+2} in $K_4[Fe(CN)_6]$ is 6.
Coordination number of Cu^{+2} in $[Cu(NH_3)_4]SO_4$ is 4.

22. What is meant by Coordination Sphere? Give one example. **(3 times)(2017=2 time)**

Ans: The central metal atom or ion along with ligands is called the coordination sphere. It is usually placed in square brackets. It may be anionic, cationic or neutral.

Example: In $K_4[Fe(CN)_6]$, $[Cu(NH_3)_4]SO_4$ and $[Ni(CO)_4]$:
$[Fe(CN)_6]^{-4}$ is anionic, $[Cu(NH_3)_4]^{+2}$ is cationic and $[Ni(CO)_4]$ is neutral coordination spheres.

23. Define coordination number and coordination ligand. Give one example in each case. **(3 times)**

Ans: **Coordination number:** The number of lone pair of electrons provided by the ligands to the central metal atom or ion is called coordination number of the central metal atom or ion e.g. $K_4[Fe(CN)_6]$ and $[Ag(NH_3)_2]Cl$. In these examples coordination number of iron is 6 and that of copper is 4.

Coordination ligand: The atoms or ions or neutral molecules, which surround the central metal atom ion and donate electron pairs to it, are called ligands. They may be anions or neutral molecules e.g. $K_4[Fe(CN)_6]$.

In this example CN^- is anionic ligand. Ligand having two donor aotms are called bidentate ligands. e.g.

Oxalate anion $\begin{array}{c} COO^- \\ | \\ COO^- \end{array}$ is a bidentate ligand and its coordination with the metal ion occurs through its both negatively charged oxygen atoms.

Topic No: 6.3.2: Chelates:

24. What are Chelate and what they contain? **(6 times)**

Ans: **Chelate:-** When all the donor atoms of a polydentate ligand get coordinated with the same metal ion, a complex is formed which contains one or more rings in its structure and hence is called a Chelate. Metal chelates are more stable than metal complexes.

25. What are Chelates? Give an example. **(3 times)**

Ans: Chelates:-When all the donor atoms of a polydentate ligand get coordinated with the same metal ion, a complex is formed which contains one or more rings in its structure and hence is called a Chelate. Metal chelates are more stable than metal complexes.

Example: $[Pt(C_2O_4)_2]^{-2}$

Topic No: 6.3.3: Nomenclature:

26. Write the names of following complexes: (I)$K_2(Cu(CN_4))$ (II) $(Fe(H_2O)_6)^{3+}$ **(2 times)**

Ans: (I). Names of $K_2[Cu(CN)_4]$: Potassium tetracyanocuprate (II)
(II). Names of $[Fe(H_2O)_6]^{3+}$: Hexa aqua iron (III) ion

27. Write IUPAC names of following complexes.(i) $Na_3[CoF_6]$ (ii)$[Co(NH_3)_6]Cl_3$

Ans: IUPAC names $Na_3[CoF_6]$ and $[Co(NH_3)_6]Cl_3$:
IUPAC names of $Na_3[CoF_6]$ = Sodium hexaflourocobaltate(III)
IUPAC names of $[Co(NH_3)_6]Cl_3$ = Hexammine cobalt(III) chloride

28. Name the following complex according to IUPAC System.
(a) $[Cr(OH)_3(H_2O)_3]$ (b) $K_2[Pt(Cl)_6]$

Ans: IUPAC Names:
(a) $[Cr(OH)_3(H_2O)_3]$ = Triaquotrihydroxochromium (III)
(b) $K_2[Pt(Cl)_6]$ = Potassium hexachloro palatinate (IV)

29. Name the following complexes according to IUPAC system.
(i) $[Pt(Cl)(NO_2)(NH_3)_4]SO_4$ (ii) $[Fe(CO)_5]$

Ans: (i) Tetraamine chloronitro platinum (IV)sulphate (ii) Pentacarbonyl Iron (0)

Topic No: 6.4: Iron:

30. Write down chemical formulas of (i) Magnetite (ii) Haematite.

Ans: Magnetite : Fe_3O_4
Haematite: Fe_2O_3

31. What is medium carbon steel.Also write its uses.

Ans: Medium carbon steel contains 0.2 – 0.7 % Carbon. It is harder than mild steel. It is also malleable and ductile. It is used in making rails, axles, castings.

32. How the entrapped gases are removed from the steel? **(4 times)**

Ans: In order to remove entrapped bubbles of gases, such as O_2,N_2 and CO_2 a little aluminium or ferro-silicon is also added. Aluminium removes nitrogen as nitride. $2Al + N_2 \rightarrow 2AlN$, and oxygen as Oxide $2Al + 3O_2 \rightarrow 2Al_2O_3$

33. Name different forms of iron and which is the purest. **(2 times)**

Ans: (a). Pig iron or cast iron: 2.5 to 4.5% carbon
(b). Wrought iron: :0.12 to 0.25 carbon
(c). Steel :0.25 to 2.5 % carbon
Purest form of iron is Wrought iron.

34. Differentiate between wrought Iron and Steel.

Ans: They differ in carbon content as follows:
(a). Wrought iron: :0.12 to 0.25 carbon
(b). Steel : 0.25 to 2.5 % carbon

35. Compare cast iron, wrought iron and steel with reference to percentage of carbon? **(2 times)**

Ans: Comparison of steel:
(a). Pig iron or cast iron: 2.5 to 4.5% carbon
(b). Wrought iron: : 0.12 to 0.25 carbon
(c). Steel : 0.25 to 2.5 % carbon

Classification of steel:
Mild Steel: 0.1 – 0.2% Carbon
Medium Carbon Steel: 0.2 – 0.7% Carbon
High Carbon Steel: 0.7 – 1.7% Carbon

Topic No: 6.5.1: Corrosion:

36. Define corrosion? **(2 Times)**

Ans: **Corrosion:-**Any process of chemical decay of metal is due to the action of surrounding medium is called corrosion.

37. Why does damaged tin plated iron get rusted quickly? **(3 times)**

Ans: If the protective coating is damaged, then iron comes into contact with moisture. A galvanic cell is established in which tin acts as a cathode and iron as an anode. The electrons flow from iron to tin, where they discharge H^+ ions, leaving behind OH^- in the solution. These hydroxide ions react with iron forming $Fe(OH)_3$ which dissolves rapidly in water. From this, it can be concluded that plated iron gets rust more rapidly when the protective coating is damaged than the non-plated iron.

38. What is Tin plating & what happens when it is damaged? / Discuss Cathode Coating. **(4 times)**

Ans: **Tin plating:**The process of tin plating consists of dipping the clean sheet of iron in a bath of molten tin and then passing it through hot pair of rollers.

Damaged tin plating: If the protective coating is damaged, then iron comes into contact with moisture. A galvanic cell is established in which tin acts as a cathode and iron as an anode. The electrons flow from iron to tin, where they discharge H^+ ions, leaving behind OH^- in the solution. These hydroxide ions react with iron forming $Fe(OH)_3$ which dissolves rapidly in water. From this, it can be concluded that plated iron gets rust more rapidly when the protective coating is damaged than the non-plated iron.

39. Define sacrificial corrosion. **(4 times)**

Ans: **Sacrificial corrosion:**If a protective layer of zinc is damaged a galvanic cell is established in the presence of moisture. Iron serves as a cathode and zinc as an anode. Electrons flow from zinc to iron, as a result of which Zn decays while Fe remains intact. This is called sacrificial corrosion. $Fe^{+2} + Zn \rightarrow Zn^{+2} + Fe$

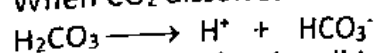
40. How does process of galvanizing protect iron from rusting? / How Zinc coating or anode coating prevents the iron from corrosion? / What is anode coating? **(8 times)**

Ans: Galvanizing is done by dipping a sheet of iron in a zinc chloride solution and heating. The iron sheet is then removed, rolled into zinc bath and air cooled. In this case, if a protective layer of zinc is damaged a galvanic cell is established in the presence of moisture. Iron serves as a cathode and zinc as an anode. Electrons flow from zinc to iron, as a result of which Zn decays, while Fe remains intact. This is called sacrificial corrosion. This is the way galvanizing helps protecting iron from rust.

41. Under what conditions does aluminium corrode.

Ans: **Conditions of Corrosion:**

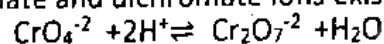
When CO_2 dissolves in water forming H_2CO_3 which ionize as follows.

$H_2CO_3 \longrightarrow H^+ + HCO_3^-$

This form a galvanic cell in which aluminium releases electrons and changes to Al^{+3} ions. Thus Al corrodes.

Topic No: 6.6: Chromates and dichromates:

42. How chromate ions are converted into dichromate ions? **(4 times)**

Ans: Chromate and dichromate ions exist in equilibrium as:

$CrO_4^{-2} + 2H^+ \rightleftharpoons Cr_2O_7^{-2} + H_2O$

On adding an acid the equilibrium will shift towards right and chromate ions will be converted into dichromate ions.

43. Write formulas of chromate and Dichromate ions. In which colour they usually exist?

Ans:

Formula of chromate ions : CrO_4^{-2}.

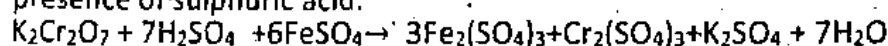
Colours : Almost all chromates are yellow in colour.

formula of dichromate ions : $Cr_2O_7^{-2}$

Colours : Almost all dichromates are orange red in colour.

44. How does $K_2Cr_2O_7$ acts as a oxidizing agent in presence of H_2SO_4? **(2 times)**

Ans: (i). Potassium dichromate oxidizes ferrous sulphate to ferric sulphate in the presence of sulphuric acid.

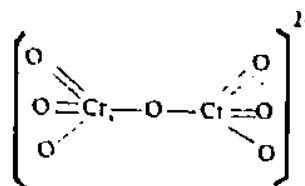
$K_2Cr_2O_7 + 7H_2SO_4 + 6FeSO_4 \rightarrow 3Fe_2(SO_4)_3 + Cr_2(SO_4)_3 + K_2SO_4 + 7H_2O$

(ii). Potassium dichromate oxidizes KI to I_2 in the presence of sulphuric acid.
$K_2Cr_2O_7 + 7H_2SO_4 + 6KI \rightarrow 4K_2SO_4 + Cr_2(SO_4)_3 + 3I_2 + 7H_2O$

45. Explain chromyl chloride test and give its equation. **(4 times)**

Ans: When solid potassium dichromate is heated with solid metal chloride in the presence of concentrated sulphuric acid chromyl chloride is produced.
$K_2Cr_2O_7 + 4NaCl + 6H_2SO_4 \rightarrow 2KHSO_4 + 4NaHSO_4 + 2CrO_2Cl_2 + 3H_2O$

46. Write structure of di-chromate ion $Cr_2O_7^{-2}$.

Ans:

$$\left[O=Cr(=O)(O)-O-Cr(=O)(O)=O \right]^{2-}$$

47. Write two uses of $K_2Cr_2O_7$. **(2 times)**

Ans: (i). $K_2Cr_2O_7$ finds extensive use in dyeing.
(ii). It is used in leather industries for chrome tanning.
(iii). It is used as an oxidizing agent.

Topic No: 6.7: Potassium Permanganate

48. Complete & balance following equation : $KMnO_4 + FeSO_4 + H_2SO_4 \rightarrow$

Ans: **Completion of chemical equation:**
$2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$

49. Give any two uses of $KMnO_4$? **(6 times)**

Ans: (i). It is used as an oxidizing agent.
(ii). it is used as disinfectant and a germicide.
(iii). it is used in manufacturing of many organic compounds.

2019

50. Give systematic name of $Na_3[CoF_6]$

Ans: $Na_3[CoF_6]$
Sodium hexafluorocobaltate (III)

51. Give systematic names of following complexes. (a) $K_2[PtCl_6]$ (b) $[Co(NH_3)_4]Cl_3$

Ans: (a) $K_2[PtCl_6]$ ______ *Potassium hexachloroplatinate (IV)*
(b) $[Co(NH_3)_4]Cl_3$ ______ *Tetra ammine Cobalt (III) Chloride.*

52. Why transition metals exhibit variable valency.

Ans: They show variable valency because of involvement of unpaired d – electrons in addition to s – electrons in bond formation.
This increases no. of valencies for transition metals.

53. Write chemistry of chromyle chloride test.

Ans: When solid $K_2Cr_2O_7$ is heated with solid metal chloride, in the presence of conc. H_2SO_4, Chromyl chloride is produced.

$$K_2Cr_2O_7 + 4NaCl + 6H_2SO_4 \longrightarrow 2KHSO_4 + 4NaHSO_4 + 2CrO_2Cl_2 + 3H_2O$$

54. Give systematic names to the given compounds. (a) $K_3[Cu(CN)_4]$ (b) $[Fe(CO)_5]$

Ans: (a) $K_2[Cu(CN)_4]$, Potassium tetracyanocuprate (II)
(b) $[Fe(CO)_5]$ Pentacarbonyl Iron (0)

55. Give systematic names of following:
(a) $[Pt(HO)_2(NH_3)_4]SO_4$ (b) $[Fe(OH_2)_6]^{2+}$

Ans: (a) $[Pt(HO)_2(NH_3)_4]SO_4$ Tetra ammine dihydroxoplatinum (IV) Sulphate
(b) $[Fe(OH_2)_6]^{2+}$ Hexaaqua Iron (II) Ion

2021

56. Write down the name of any four methods for prevention of corrosion.

Ans: Methods for prevention of corrosion:

(i) By painting and greasing

(ii) By alloying

(iii) By coating of one metal over the surface of the other.

(iv) By electroplating

57. Define corrosion. How corrosion is promoted when metal is dipped in water?.

Ans: Any process of chemical decay of metals due to the action of surrounding medium is called corrosion.

when the metal is in contact with water. The compounds formed in this case may dissolve in water, allowing the corrosion to penetrate further into the metal.

∴ Besides dissolving the compounds, water also promotes electrochemical process which is one of the main causes of rapid corrosion.

CHAPTER NO:6 LONG QUESTIONS TRANSITION ELEMENTS IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 6.1

1 **What are transition metals? Why are they so called?**

Ans: (Text Book Page No:97)

Topic No: 6.2.1

2 **Define paramagnetism and discuss behaviour in transition element.**

Ans: (Text Book Page No:101)

3 **Mn^{2+} and Fe^{2+} have the strongest paramagnetic behaviour while Sc^{3+} and Zn^{2+} have the lowest. Discuss.** **(2 times)**

Ans: (Text Book Page No:101)

Topic No: 6.3.1

4 **Explain the following terms: (i) Ligands (ii) Coordination number (iii) Chelates (iv) Coordination sphere**

Ans: (Text Book Page No:104)

5 **Explain following terms by giving examples(i) Ligands (ii)Co-ordination sphere**

Ans: (Text Book Page No:104)

6 **Define the following and give on example of each.** **(2 times)**

(i) ligand (ii) Chloroprene (iii) Co-ordination sphere (iv) Chelate

Ans: (Text Book Page No:104)

Topic No: 6.3.3

7 **Write down any four rules for renaming of complex compounds.** **(3 times)**

Ans: (Text Book Page No:105)

8 **Write systematic name of the following complexes:**

(i) $[Co(NH_3)_6]$ (ii) $Na_3[COF_6]$ (iii) $[pt(OH)_2(NH_3)_4]SO_4$ (iv) $K_2[ptCl^6]$

Ans: (Text Book Page No:105)

9 **Give Systematic names to following complexes:**

(i) $[Pt(OH)_2(NH_3)_4]SO_4$ (ii) $[Cr(OH)_3(H_2O)_3]$

(iii) $K_2[Cu(CN)_4]$ (iv) $[Fe(H_2O)_6]^{2+}$

Ans: (Text Book Page No:105)

Topic No: 6.4.3

10 **Explain the process of manufacture of Wrought Iron from Cast iron. (3 times)**

Ans: (Text Book Page No:106)

11 **How will you prepare Wrought iron from Cost iron by puddlingProcess.** **(4 times)**

Ans: (Text Book Page No:106)

Topic No: 6.4.6

12 Explain open hearth process for the manufacture of steel. (4 times)
Ans: (Text Book Page No:107+108)
13 How steel can be manufactured by Bessemer's process? (6 times)
Ans: (Text Book Page No:108)

Topic No: 6.5

14 What is corrosion?Explain the electrochemical theory of corrosion. (5 times)
Ans: (Text Book Page No:109+110)

Topic No: 6.5.1

15 Discuss Electrochemical theory of Corrosion. (4 Times)
Ans: (Text Book Page No:110)

Topic No: 6.5.2

16 Distinguished between cathode coating and anode coating of iron.
Ans: (Text Book Page No:111)

Topic No: 6.6.4

17 What happened when $K_2Cr_2O_7$ reacts with H_2S, $FeSO_4$, KI, NaCl separately? (2 times)
Ans: (Text Book Page No:112+113)
18 Discuss the reaction of potassium dichromate with: (i) Hydrogen sulphide (ii) Ferrous sulphate (iii) Potassium iodide (iv) Sodium chloride
Ans: (Text Book Page No:112+113)
19 Describe and write an equation for formation of Chromyl chloride. Give its applications. (2 times)
Ans: (Text Book Page No:113)

Topic No: 6.7.1

20 How does potassium permanganate reacts with the following : (2 times)
(i) H_2S (ii) $FeSO_4$ (iii) Oxalic acid (iv) KOH
Ans: (Text Book Page No:114+115)
21 Describe the preparation of $KmnO_4$ by electrolytic oxidation process. Also give its uses.
Ans: (Text Book Page No:113)

2018

22. Give two methods for the preparation of $K_2Cr_2O_7$, also give its two uses?
Ans: (Text Book Page No:112+113)
23. Explain the following properties of transition metals. (2 times)
(i) Paramagnetism (ii) Colour
Ans: (Text Book Page No:101+102)
24. Define corrosion. Explain electrochemical theory of Corrosion in detail.
Ans: (Text Book Page No:109+110)
25. Prepare $KMnO_4$ byStadeler's process and electrolytic oxidation process? (2 times)
Ans: (Text Book Page No:113+114)
26. Explain the following properties of transition metals.
(i) Colour (ii) Chelate formation
Ans: (Text Book Page No:102+104)

2021

27. Write a note on these properties of transition elements:
(i) Binding energies (ii) Oxidation state.
28. Discuss the following properties of transition metals:
(i) Para magnetism (ii) Oxidation State
29. Give any Four properties of Transition Elements. (2 Times)
30. Write note on : (i) Tin Plating (ii) Zinc Coating
31. Briefly explain the following general characteristics properties of transition elements
(I) Paramagnetism (II) Binding Energies

CHAPTER NO:7 OBJECTIVES (MCQ'S) FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 7.1: Introduction:

1. Vital force theory was rejected by:
(a) G.N.Lewis (b) Friedrick Wohler
(c) Scientist of 20th century (d) Greek Philosophers

2.The chemist synthesized urea from ammonium cyanate was: (4 times)
(a) Berselius (b) Koble (c) Wholer (d) Lavoiscr

3--SH functional group is called:
(a) Cyano (b) Mecrapto (c) Nitro (d) Carboxyl

Topic No: 7.6: Reforming:

4. The process used to improve quality of gasoline is called:
(a) Thermal cracking (b) Reforming (c) Steam cracking (d) Combustion

Topic No: 7.9: Hybridization:

5. In which of the following compound carbon atom is sp^2-hybridized:
(a) CH_3CN (b) $CH_2=CH_2$ (c) C_2H_2 (d) CH_2Cl_2

6.A double bond consists of: (8 times)
(a) One sigma and one pi bonds (b) Two sigma bonds
(c) One sigma and two pi bonds (d) Two pi bonds

7.The state of hybridization of carbon in methane is : (7 times)
(a) Sp^3 (b) Sp^2 (c) Sp (d) dsp^2

8. Presence of double or triple bond is sign of: (3 times)
(a) Unsaturation (b) Saturation (c) Addition (d) Substitution

9. Linear shape is associated with which set of Hybrid orbital: (8 times)
(a) sp (b) sp^2 (c) sp^3 (d) dsp^2

10. The hybridization of carbon atom in HCHO is:
(a) Sp (b) Sp^2 (c) Sp^3 (d) dsp

11-One of the following Molecule is sp^2 hybridized:
(a) CH_3-CH_3 (b) $CH_2=CH_2$ (c) $CH\equiv CH$ (d) CH_4

12- Which set represent the planner triangular shape: (7 times)
(a) Sp^3 (b) Sp^2 (c) Sp (d) dSp^2

13- Each carbon atoms is sp^3 – hybridized in the class of:
(a) Alkenes (b) Alkynes (c) Ketones (d) Alkanes

14- The state of hybridization in ethane molecule is: (2 times)
(a) dsp^2 (b) sp^3 (c) sp^2 (d) sp

15- The carbon atom of carboxyl group is hybridized:
(a) Sp (b) Sp^2 (c) Sp^3 (d) dsp^2

16. The linear shape is associate with ________ set of hybrid orbitals: (4 times)
(a) sp (b) sp^2 (c) sp^3 (d) dsp^2

17.The bond angle between any two Sp^2-Hybridized orbitals is of:
(a) 120° (b) 180° (c) 109.5° (d) 107.5°

18.The state of hybridization of carbon in ethane is:
(a) Sp^3 (b) Sp^2 (c) Sp (d) dSp^2

Topic No: 7.10: Isomerism:

19.Pentane (C_5H_{12}) shows how many chain isomers? (2 times)
(a) 2 (b) 3 (c) 4 (d) 5

20.Dimethyl ether may show which types of isomerism: (2 times)
(a) Tautomerism (b) Metamerism (c) Geometric (d) Functional group

21. Tautomerism arises due to shifting of:
(a) Sigma electrons (b) Neutrons (c) Pi-Electrons (d) Protons

22- Which class of organic compounds shows metamerism:
(a) Aldehydes (b) Ethers (c) Alkenes (d) Alkanes

23. The isomerism shown by alkanes is:
(a) Skeletal (b) Position (c) Geometric (d) Metamerism

24. Ethers show the phenomenon of: **(8 times)**
(a) Position isomerism (b) Functional group isomerism
(c) Metamerism (d) Cis-trans isomerism

2018

25. Select from the following the one which is an alcohol: **(2 times)**
(a) CH_3-CH_2-OH (b) CH_3-O-CH_3 (c) CH_3COOH (d) C_2H_5–Br

2019

26. Both CH_3COOH and $HCOOCH_3$ show isomerism:
(a) position (b) chain (c) geometric (d) functional group

27. In t-butyl alcohol, the tertiary carbon is bonded to:
(a) Two hydrogen atoms (b) Three hydrogen atoms (c) One hydrogen atom (d) No hydrogen atom

28. Tetra Ethyl Lead (T.E.L.) is used as:
(a) Pain Killer (b) Petroleum Additive (c) Fire Extinguisher (d) Moth Repellent

2021

29. Friedrick Wholer synthesized urea by heating:
(a) NH_4Cl (b) $(NH_4)_2CO_3$ (c) NH_4CNO (d) NH_3

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	C	B	B	B	A	A	A	A	B	B	B	D	B	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	
A	A	A	B	B	D	B	A	C	A	D	D	B	C	

CHAPTER NO:7 SHORT QUESTIONS FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 7.1: Introduction:

1 What is vital force theory? **(6 times)**

Ans: Early scientists believe that organic compounds could be manufactured only by and within living things under action of a super natural force called vital force and these compounds could never be synthesized from inorganic materials, this theory was referred to as vital force theory.

2 What is the significance of Wohler's work? **(4 times)**

Ans: Significance of Wohler's work: Friedrick Wohler synthesized urea $(NH_2)_2CO$, an organic compound from ammonium cyanate, NH_4CNO, a substance of known mineral origin.

$NH_4CNO \rightleftharpoons (NH_2)_2CO$

Since the synthesis of urea from ammonium cyanate, million of organic compounds have been prepared and analyzed.

3 Why vital force theory was rejected.

Ans: Rejection of vital force theory: Vitalfoce theory was rejectedby Friedrick Wohler when he synthesized urea $(NH_2)_2CO$, an organic compound from ammonium cyanate, NH_4CNO, a substance of known mineral origin.

$NH_4CNO \rightleftharpoons (NH_2)_2CO$

Since the synthesis of urea from ammonium cyanate, million of organic compounds have been prepared and analyzed.

4 Name organic compound first of all prepared in the laboratory, and how?

Ans: Friedrick Wohler synthesized urea $(NH_2)_2CO$, an organic compound from ammonium cyanate, NH_4CNO, a substance of known mineral origin.

$NH_4CNO \rightleftharpoons (NH_2)_2CO$

Topic No: 7.2: Some Features of Organic Compounds:

5 Write down any two characteristics features of organic compounds?

Ans: **1..Non Ionic Character of Organic Compounds:** Organic compounds are generally covalent compounds, therefore, do not give ionic reactions.

2..Isomerism: Isomerism is a very common phenomenon in organic compounds. Very often more than one compounds are represented by the same molecular formula. However, they have different structural formulas.

Topic No: 7.3: Importance of Organic Chemistry:

6 Write down important uses of organic compounds in our daily life?

Ans: 1.. Organic compounds are used to synthesize proteins, enzymes, carbohydrates, lipids, vitamins and nucleic acid by living bodies.

2.. These compounds are used to produce medicines, clothing, chemicals, food etc.

3.. These are used in the manufacturing of plastics, rubbers, preservatives paints, varnishes, textile fibers, fertilizers, pesticides, detergents cosmetics, dyes etc.

Topic No: 7.4: Sources of Organic Compound:

7 What is meant by Carbonization of coal? (4 times)

Ans: Càrbonization of coal:-When coal is heated in absence of air at 500-1000^{0}C, it is converted into coke, coal gas and coal tar, coa tar contains large no. of organic compounds, which are separated by fractional distillation.

8 How is coal produced from the remains of Trees? (2 times)

Ans: Coal in nature was formed from the remains of the trees buried inside the earth crust some 500 million years ago. Due to the bacterial and chemical pressure inside the earth curst, after passing through different stages transformed into coal

9. What are main sources of organic compounds? (2 times)

Ans: 1. Coal:Coal in nature was formed from the remains of the trees buried inside the earth crust some 500 million years ago. Due to the bacterial and chemical pressure inside the earth curst, peat got transformed into coal, this process is called carbonization of coal. Coal is important solid fuel and becomes a source of organic compound when subjected to carbonization or destructive distillation.

2. Natural gas: It is an important mean of energy especially for countries like Pakistan which are deficient in the production of mineral oil and coal. It is a mixture of low boiling hydrocarbons. Major portion of the natural gas is methane. It is so formed by the decomposition of organic matter.

3. Petroleum: Mineral oil is called petroleum when it is in the refined form it is thought to have been formed by slow chemical and biochemical decomposition of the remains of organic matter found between the sedimentary rocks.

10. Describe natural sources of methane (Hydrocarbon) in atmosphere. (2 times)

Ans: Natural sources of methane:Natural gas is main source of methane. It consists of about 87% by volume of CH_4. It is used for fuel and making petrochemicals.

11. What is natural gas write its composition and two uses. (2 times)

Ans: Natural gas:Natural gas is an important mean of energy especially for countries like Pakistan which are deficient in the production of mineral oil and coal. It is a mixture of low boiling hydrocarbons. Major portion of the natural gas is methane. It is so formed by the decomposition of organic matter. This gas being cheaper is used for power generation, in cement and fertilizer industries, as a fuel in general industries and for domestic purposes.

12. Define Refiner? Mention oil refineries in Pakistan. (2 times)

Ans: Crude oil is when extracted form rocks it appear like a liquid of blackish colour. It is refined to get different petroleum fraction. At present four oil refineries are in operation in our country. One oil refinery known as Attock Oil Refinery is located at two oil refineries have been established at Karachi which have about 2.13 million tons of oil refining capacity. Another redinery known as Pak-Arab refinery is located at Mahmud Kot near Multan.

Topic No: 7.5: Cracking of Petroleum:

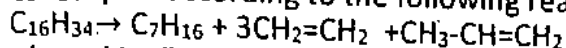
13. Illustrate two principle fractions obtained from petroleum giving boiling point range, composition and uses?

Ans: **Principle fractions:-**

No.	Fraction	Boiling Point Range (ºC)	Composition	Uses
1	Natural gas	<20	CH_4-C_4H_{10}	Fuel, Petrochemicals
2	Petroleum Ether	20-60	C_5H_{12},C_6H_{14}	Solvent

14. Write a short note on cracking of petroleum? **(6 times)**

Ans: **Cracking of petroleum:-** Breaking of higher hydrocarbons having high boiling points into a variety of lower hydrocarbons, which are more volatile (low boiling) is called cracking of petroleum. For example, a higher hydrocarbons$C_{16}H_{34}$ splits according to the following reaction.

$$C_{16}H_{34} \rightarrow C_7H_{16} + 3CH_2{=}CH_2 + CH_3\text{-}CH{=}CH_2$$

15. Define" Thermal cracking". **(3 times)**

Ans: **Thermal cracking:-**Breaking down of large molecules by heating at high temperature and pressure is called thermal cracking. It is particularly useful in the production of unsaturated hydrocarbons such as ethane and propene.

16. Discuss two methods of cracking of petroleum? **(2 Times)**

Ans: 1.. **Thermal cracking:-** Breaking down of large molecules by heating at high temperature and pressure is called thermal cracking. It is particularly useful in the production of unsaturated hydrocarbons such as ethane and propene.

2.. **Catalytic cracking:-** Higher hydrocarbons can be cracked at lower temperature (500ºC) and lower pressure (2 atm), in the presence of a suitable catalyst. A typical catalyst used for this purpose is a mixture of silica (SiO_2) and alumina (Al_2O_3). Catalytic cracking produces gasoline of higher octane number and therefore this method is used for obtaining better quality gasoline.

17. Define catenation? **(5 times)**

Ans: **Catenation:-** The property of carbon atoms to link with other carbon atoms to form long chains or rings is called catenation. The main reason of such large number of compounds is catenation of carbon atoms.

18. What is catalytic cracking? **(4 times)**

Ans: **Catalytic cracking:-**Higher hydrocarbons can be cracked at lower temperature (500ºC) and lower pressure (2 atm), in the presence of a suitable catalyst. A typical catalyst used for this purpose is a mixture of silica (SiO_2) and alumina (Al_2O_3). Catalytic cracking produces gasoline of higher octane number and, therefore, this method is used for obtaining better quality gasoline.

19. Write importance of cracking.

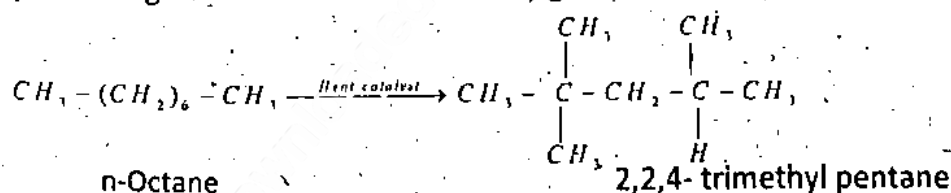
Ans: Besides increasing the yield fo gasoline, cracking has also produced large amount of useful by-products, such as ethane, propene, butane and benzene. These are used for manufacturing drugs, plastics, detergents, synthetic fibres, fertilizers, weed killers and important chemicals like ethanol, phenol and acetone.

Topic No: 7.6: Reforming:

20. Branched hydrocarbons are better as a fuel as compared to straight chain, explain?

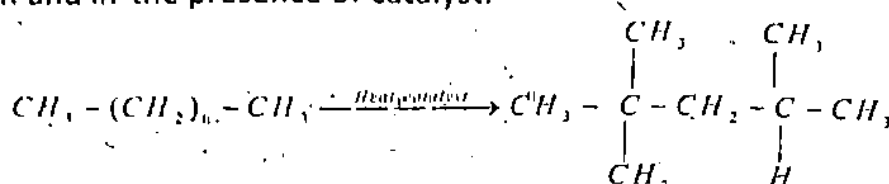
Ans: Straight chain hydrocarbons have low octane numbers and make poor fuels. Experiments have shown that isooctane or 2,2,4- trimethyl pentane burns very smoothly in an engine and has been arbitrarily given an octane number of 100.

$$CH_3-(CH_2)_6-CH_3 \xrightarrow{\text{Heat catalyst}} CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_2-\underset{H}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_3$$

n-Octane 2,2,4- trimethyl pentane

21. Define reforming of petroleum and give one example? **(3 times)**

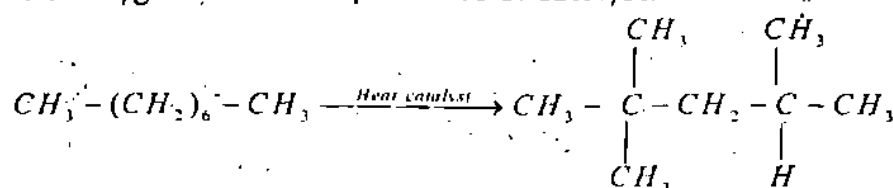
Ans: **Reforming of petroleum:-** The octane number of galosline is improved by a process called reforming. It involves the conversion of straight chain

hydrocarbons into branched chain hydrocarbons by heating in the absence of oxygen and in the presence of catalyst.

$$CH_3-(CH_2)_6-CH_3 \xrightarrow{Heat/catalyst} CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_2-\underset{H}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_3$$

n-Octane 2,2,4- trimethyl pentane

22. Octane number of gasoline is improved by reforming. Explain. / How quality of fuel can be improved? / How octane number of alkanes can be improved. / What is octane number? How can it be improved? (5 times)

Ans: The quality of gasoline is measured in term of its octane number. Higher the octane number higher will be the quality of gasoline (alkane). The octane number of galosline is improved by a process called reforming. It involves the conversion of straight chain hydrocarbons into branched chain by heating in the absence of oxygen and in the presence of catalyst.

$$CH_3-(CH_2)_6-CH_3 \xrightarrow{Heat/catalyst} CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_2-\underset{H}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_3$$

n-Octane 2,2,4- trimethyl pentane

23. Give idea about knocking in the internal combustion engine.

Ans: <u>**Knocking in the internal combustion engine:**</u>

The gasoline fraction present in petroleum in generally not of good quality. When it burns in an automobile engine, combustion can be initiated before the spark plug fires. This produces a sharp metallic sound called knocking which greatly reduces the efficiency of an engine.

Topic No: 7.7: Classification of Orgnanic Compounds:

24. Differentiate between homocyclic& heterocyclic compounds? (8 times)

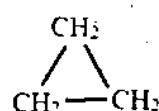
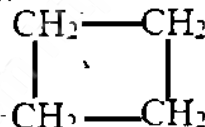
Ans: <u>**Homocycliccompounds:**</u> The compounds in which the ring consists of only carbon atoms. These are also called homocyclic or carbocyclic compounds. Homocyclic compounds are further classified as:

Alicyclic compounds ii. Aromatic compounds.

<u>**Heterocyclic compounds:**</u> The compounds in which the ring consists of atoms of more than one kind are called heterocyclic compounds. In heterocyclic compound generally one or more atoms of elements such as nitrogen(N), oxygen(O), or sulphur (S) are present. The atom other than carbon like N, O, or S, present in the ring is called a hetero atom.

25. What are Alicyclic compound? Write one example. (2 Times)

Ans: The compounds in which the ring consists of only carbon atoms is called carbocyclic compounds. For example:

CH_2 / CH_2—CH_2 (triangle) — Cyclopropane

CH_2—CH_2 / CH_2—CH_2 (square) — cyclobutane

26. Differentiate between alicyclic & aromatic compuounds? (7 times)

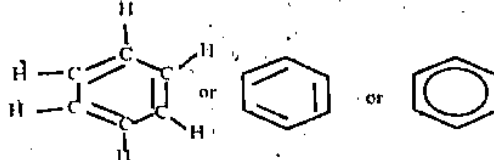
Ans: <u>**Alicyclic compounds:**</u>The homocyclic compounds which contains a ring of three or more carbon atoms and resembling aliphatic compounds are called alicyclic compounds. The saturated alicyclic hydrocarbons have the general formula C_nH_{2n}.

For example:

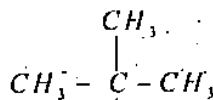
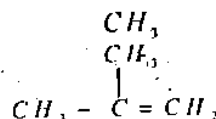
CH_2 / CH_2—CH_2 (triangle) — Cyclopropane

CH_2—CH_2 / CH_2—CH_2 (square) — cyclobutane

Aromaticcompounds: The carbocyclic compounds containing at least one benzene ring, six carbon atoms with three alternate double and single bonds are called aromatic compounds. These bonds are usually shown in the form of a circle. For example benzene

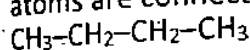
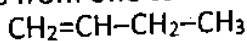
or or

27. **Write the structural formulae for Neopentane and Isobutylene?**

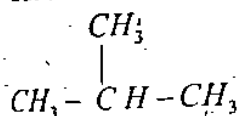
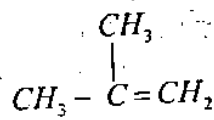
Ans: **Structural formulae for Neopentane and Isobutylene:-**

Structural formula for Neopentane: $CH_3-C(CH_3)_2-CH_3$

Structural formula for Isobutylene: $CH_3-C(CH_3)=CH_2$

28. **Classify open chain compounds with examples.**

Ans: Open chain may be branched or non branched. Open chain hydrocarbons are also called aliphatic compounds.

(a). **Straight chain compounds:** Those organic compounds in which the carbon atoms are connected in series from one to the other. For example:

$CH_3-CH_2-CH_2-CH_3$ n-Butane

$CH_2=CH-CH_2-CH_3$ 1-Butene

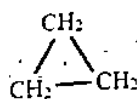
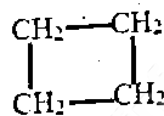
(b). **Branched chain compounds:** Those organic compounds in which the carbon atoms are attached on the side of the chain. For example:

$CH_3-CH(CH_3)-CH_3$ 2-Methylpropane(Iso-Butane)

$CH_3-C(CH_3)=CH_2$ 2-Methylpropene

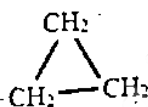
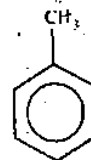
29. **Give names of four compounds which are homocyclic but are not aromatic?**

Ans: 1 cyclopropane 2 cyclobutane 3.. cyclo pentane 4.. cyclohexane **(5 times)**

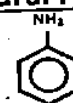
30. **What are Alicyclic Compounds? Give an example.**

Ans: **Alicyclic compounds:** Thehomocyclic compounds which contains a ring of three or more carbon atoms and resembling aliphatic compounds are called alicyclic compounds. The saturated alicyclic hydrocarbons have the general formula C_nH_{2n}.

For example: Cyclopropane (CH_2 ring of three CH_2) cyclobutane (CH_2-CH_2 / CH_2-CH_2 ring)

31. **Give formulas of cyclopropaneand toluene.**

Ans: **Formulas of cyclopropaneand toluene:**

Formula of cyclopropane : (CH_2, CH_2-CH_2 ring) Formula of toluene : (CH_3 on benzene ring)

32. **Name the formulae of two compounds"(a)Aniline (b)Phenanthrene**

Ans:

Name	Molecular Formula	Structural Formula
Aniline	$C_6H_5NH_2$	(NH_2 on benzene ring)
Phenanthrene	$C_{14}H_{10}$	(three fused rings)

33. Write name and structure of two aromatic heterocyclic compounds?(3 times)

Ans:

No:	Name	Structure
1..	Pyridine	
2..	Furan	

Topic No: 7.8: Functional Group:

34. Define function group. Give two examples of functional group containing oxygen? (3 times)

Ans: **Definition:** An atom or a group of atoms or a double bond or a triple bond whose presence imparts specific properties to organic compounds is called a functional group, because they are the chemically functional parts of molecules.

Examples: Formyl Group $-\overset{O}{\overset{\|}{C}}-H$, Carbonyl Group $-\overset{O}{\overset{\|}{C}}-$

Topic No: 7.9: Hybridization:

35. Give shapes and angles of following compounds using hybridization approach:
(a) $CH_2=CH_2$ (b) $HC\equiv CH$

Ans: **(a). $CH_2=CH_2$**

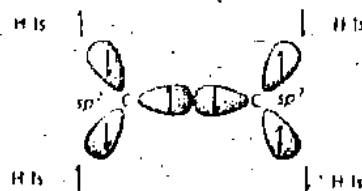
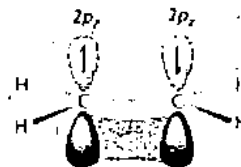
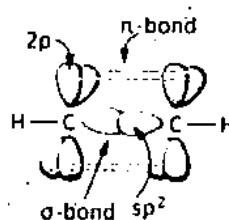
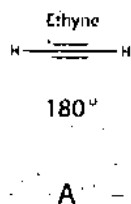
(a) C_2H_4 σ-bonded framework (b) C_2H_4 π bonding

(b). $HC\equiv CH$

Ethyne

180°

A

π-bond, 2p, σ-bond, sp²

36 In alkanes sp³ hybridization occurs. Discuss?

Ans: **sp³ hybridization:-** In Alkanes each carbon as four partially filled sp^3 hybrid orbitals. Each C – H bond is formed by $sp^3 - 1s$ overlap and each c – c bond by $sp^3 - sp^3$ overlap. The bond angle is 109.5^0 and geometry is tetrahedral.

37. Write types of bonds and shapes of HCHO and CH_3Cl using hybridization approach?

Ans:

		Types of bonds	Shapes
1..	HCHO	sp^2 hybridized $H-\overset{O}{\overset{\|}{C}}-H$	Triangular planner
2..	CH_3Cl	sp^3 hybridized H–C(H)(H)–Cl	Tetrahedral

38. When does sp-hybridization occur?

Ans: **sp-hybridization:-** When one 2s and one 2p orbitals of the carbon atom mix together to give rise to two degenerated sp hybridized atomic orbitals. These orbitals have linear shape with a bond angle of 180ºC.

39. What is Atomic Orbital Hybridization?

Ans: Mixing up of atomic orbitals to form newly generated orbitals of same energy and same shape is called atomic orbital hybridization.
For example: in carbon electron from the 2s orbital is promoted to an empty $2p_z$ orbital giving electron configuration:

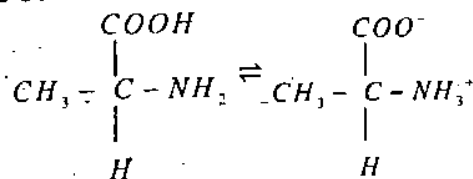
40. **When does sp^3-Hybradization occur?**

Ans: sp^3-Hybradization:- When one s and three p orbitals mix together to form four new equivalent hybrid atomic orbitals, having same shape and energy. This mode of hybridization is called tetrahedral or sp^3 hybridization. All these four sp3 hybrid orbitals are degenerated (having equal energy) and are directed at an angle of 109.5º in space to give a tetrahedral geometry.
For example, in the formation of alkane, the four hybrid atomic orbitals of carbon overlap separately with four atomic orbitals to form four equivalent bonds.

Topic No: 7.10.1: Isomerism:

41. **Define tautumerism, give an example?** **(8 times)**

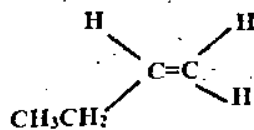
Ans: Tautumerism:-This type of isomerism arises due to shifting of proton from one atom to other in the same molecule. For example:

$$CH_3-\underset{H}{\overset{COOH}{C}}-NH_2 \rightleftharpoons CH_3-\underset{H}{\overset{COO^-}{C}}-NH_3^+$$

42. **1-Butyne does not show geometrical isomerism but 2-Butene does. Give reason?** **(3 times)**

Ans: The necessary and sufficient condition for a compound to exhibit geometric isomerism is that the two groups attached to the same carbon must be different. In 1-Butene similar hydrogen atoms are attached to the same carbon atom, so it does not exhibit geometric isomerism.

H, H, C=C, H, CH_3CH_2

But 2-Butene can exist in the form of cis and trans isomers as:

CH_3, CH_3, C=C, H, H — Cis

H, CH_3, C=C, H, CH_3 — Trans

43. **Write a brief note on geometric isomerism? / Define Cis – Trans Isomerism. Give one example.** **(2 Times)**

Ans: **Definition:** Such compounds which possess the same structural formula, but differ with respect to the positions of the identical groups in space are called geometric isomers, and the phenomenon is known as the geometric isomerism.
Explanation: Two carbon atoms joined by a single bond are capable of free rotation about it. However, when two carbon atoms are joined by a double bond, they cannot rotate freely. As a result, the relative positions of the various groups attached to these carbon atoms get fixed and give rise to cis-trans isomers.
The necessary and sufficient condition for a compound to exhibit geometric isomerism is that the two groups attached to the same carbon must be different.
Examples: In 1-Butene similar hydrogen atoms are attached to the same carbon atom, so it does not exhibit geometric isomerism.

H, H, C=C, H, CH_3CH_2

But 2-Butene can exist in the form of cis and trans isomers and show geometric isomerism as:

$$\underset{\text{Cis}}{\begin{matrix} CH_3 & & CH_3 \\ & C=C & \\ H & & H \end{matrix}} \qquad \underset{\text{Trans}}{\begin{matrix} H & & CH_3 \\ & C=C & \\ CH_3 & & H \end{matrix}}$$

44. Give examples of positional isomerism in alkenes and alkynes?

Ans: **Examples of alkenes:-** $CH_3\text{-}CH_2\text{-}CH=CH_2$ (1-Butene), $CH_3\text{-}CH=CH\text{-}CH_3$ (2-Butene)

Examples of alkynes:- $CH_3\text{-}CH_2\text{-}C\equiv CH$ (1-Butyne), $CH_3\text{-}C\equiv C\text{-}CH_3$ (2-Butyne)

45. Why is restricted rotation necessary to show the geometrical isomerism? **(3 times)**

Ans: **Restricted rotation:-** Two carbon atoms joined by a single bond are capable of free rotation about it. However, when two carbon atoms are joined by a double bond, they cannot rotate freely. As a result, the relative positions of the various groups attached to these carbon atoms get fixed and give rise to cis-trans isomers.

46. Why there is a free rotation around a single bond, but not free rotation around a double bond? **(6 times)**

Ans: A c – c sigma bond is formed by linear overlape of orbitals, if there is rotation, no bond breackage results. But π bond is formed by parallel overlape of p-orbitals. By rotation p-orbitals become perpendicular and π bond is broken.

47. Explain position isomerism with an example? **(2 times)**

Ans: **Position isomerism:-** The isomerism arises due to the difference in the position of the same functional group on the carbon chain, the arrangement of carbon atoms remains the same.

Examples of alkenes:- $CH_3\text{-}CH_2\text{-}CH=CH_2$ (1-Butene), $CH_3\text{-}CH=CH\text{-}CH_3$ (2-Butene)

Examples of alkynes:- $CH_3\text{-}CH_2\text{-}C\equiv CH$ (1-Butyne), $CH_3\text{-}C\equiv C\text{-}CH_3$ (2-Butyne)

48. What is metamerism? Give an example. **(10 times)**

Ans: Isomerism arises due to the unequal distribution of carbon atoms on either side of the functional group. Such compounds belong to the same homologous series, for example diethyl ether and methyl n-propyl ether are metamers.

$CH_3\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH_3$ (Diethyl ether) $\qquad CH_3\text{-}O\text{-}CH_2\text{-}CH_2\text{-}CH_3$ (Methyl n-propyl ether)

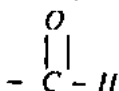
49. Write two possible isomers of C_4H_{10}. Write their IUPAC names also?

Ans: 1.. $CH_3-CH_2-CH_2-CH_3$ $\qquad$ 2.. $CH_3-\underset{}{\overset{\overset{\displaystyle CH_3}{|}}{C}H}-CH_3$

IUPAC Names: n-Butane $\qquad$ 2 Methylpropane

50. Define functional group isomerism and give an example? **(3 times)**

Ans: **Definition:** An atom or a group of atoms or a double bond or a triple bond whose presence imparts specific properties to organic compounds is called a functional group, because they are the chemically functional parts of molecules.

Example: Formyl Group $\overset{\overset{\displaystyle O}{||}}{-C-H}$

51. Cis-trans isomerism is a result of restricted rotation of carbon –carbon double bond. Discuss?

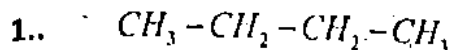
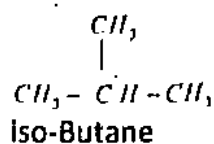
Ans: Two carbon atoms joined by a single bond are capable of free rotation about it. However, when two carbon atoms are joined by a double bond, they cannot rotate freely. As a result, the relative positions of the various groups attached to these carbon atoms get fixed and give rise to cis-trans isomers.

52. Draw all isomers of C_4H_{10}?

Ans:

1.. $CH_3-CH_2-CH_2-CH_3$

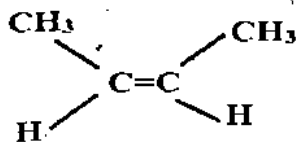
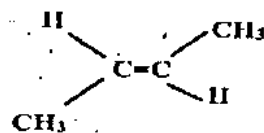
n-Butane

2..
$$\begin{array}{c} CH_3 \\ | \\ CH_3-CH-CH_3 \end{array}$$

Iso-Butane

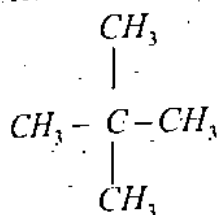
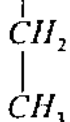
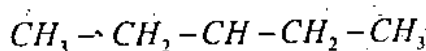
53. What are the conditions for cis and Trans isomerism?

Ans: The necessary and sufficient condition for a compound to exhibit geometric isomerism (Cis-Trans Isomerism) is that the two groups attached to the same carbon must be different.

For example: 2-Butene can exist in the form of cis and trans isomers and show geometric isomerism as:

H CH3
C=C
CH3 H

Cis Trans

54. Write structural formula of neopentane and 3-Ethylpentane.

Ans:

Neopentane 3-Ethylpentane

2019

55. Define Organic chemistry what is vital force theory. **(2 Times)**

Ans: Organic Chemistry:

Branch of chemistry which deals with study of compounds of carbon and hydrogen (Hydrocarbons) and their derivatives.

Vital Force Theory:

"It was believed by early chemists that organic compounds could be made by living things under action of super natural force, called vital force". This theory was called vital force theory.

56. Write down the useful by products of cracking process.

Ans: By products of cracking process:

Unsaturated hydrocarbons like ethene, propene, butene and benzene. These are used for making drugs, plastics, fibres, fertilizers and many other important chemicals.

57. What are isomers. Write isomers of pentane.

Ans: Isomers:

Compounds having same molecular formula but different structural formula are called isomers.

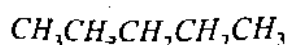
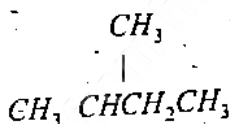
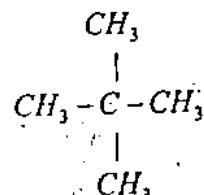
e.g; Isomers of Pentane

$CH_3CH_2CH_2CH_2CH_3$

n – pentane

$$\begin{array}{c} CH_3 \\ | \\ CH_3\ CHCH_2CH_3 \end{array}$$

Iso – pentane

$$\begin{array}{c} CH_3 \\ | \\ CH_3-C-CH_3 \\ | \\ CH_3 \end{array}$$

Neo – pentane

2021

58. What is steam cracking ? Give its application.

Ans: Definition: In this process, higher hydrocarbons in the vapour phase are mixed with steam, heated for a short duration to about 900°C and cooled rapidly.

Applications: The process is suitable for obtaining lower unsaturated hydrocarbons.

CHAPTER NO:7 LONG QUESTIONS
FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY
IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 7.1

1. What is an organic compound? Give importance of Wholer's work in development of organic chemistry.

Ans: (Text Book Page No:118)

2. Why vital force theory was rejected? What is the importance of Wohler's work it chemistry?

Ans: (Text Book Page No:118)

Topic No: 7.4

3. Explain any four uses of organic compounds.

Ans: (Text Book Page No:121)

Topic No: 7.5

4. Define cracking and discuss its different types. (7 times)

Ans: (Text Book Page No:122)

5. Define cracking of petroleum. Explain its various types and importance. (7 times)

Ans: (Text Book Page No:122)

Topic No: 7.6

6. Explain reforming of petroleum with the help of suitable example. (7 times)

Ans: (Text Book Page No:123)

7. What is meant by reforming of petroleum? Explain knocking and octane number in that regards. (3 times)

Ans: (Text Book Page No:123)

Topic No: 7.7

8. How organic compounds are classified? Give suitable examples of each type. (3 times)

Ans: (Text Book Page No:123)

9. Differentiate between homocyclic and heterocyclic compounds with two examples each. (2 times)

Ans: (Text Book Page No:124)

Topic No: 7.8

10. Define functional group. Give names and formulas of oxygen containing functional groups. (2 times)

Ans: (Text Book Page No:126)

Topic No: 7.9

11. Define Sp^3 and Sp^2 hybridization, give one example in each case. (2 Times)

Ans: (Text Book Page No:127+128)

12. What is orbital hybridization? Explain Sp^3 mode of hybridization of carbon. (4 times)

Ans: (Text Book Page No:127)

13. What is Sp hybridization? Explain structure of acetylene according to this theory. (4 times)

Ans: (Text Book Page No:129)

14. Define hybridization and also describe sp-hybridization with reference to ethyne. (4 times)

Ans: (Text Book Page No:129)

15. Define atomic orbital hybridization and describe structure of Ethene in the view of atomic orbital hybridization. (5 times)

Ans: (Text Book Page No:128)

16. Explain Sp^2 hybridization along with describing the structure of Etheneon the basis of this type of hybridization. (7 times)
Ans: (Text Book Page No:128)
17. Explain Sp^3 hybridization. How it explain the structure of methane. (2 Times)
Ans: (Text Book Page No:127)
18. Describe Structure of C_2H_4 and $C_2H_2$by process of hybridization.
Ans: (Text Book Page No:127)

Topic No: 7.10.1

19. Define any four types of isomerism with one example each. (6 times)
Ans: (Text Book Page No:130+131)
20. Discuss geometric isomerism with atleast two examples. (5 times)
Ans: (Text.Book Page No:132)
21. Draw the structural formulae of four possible isomers of C_6H_{14}.
Ans: (Text Book Page No:131)
22. Describe briefly the different types of structural isomerism. (10 times)
Ans: (Text Book Page No:130+131)
23. Explain isomerism and its various types with examples. (4 times)
Ans: (Text Book Page No:130)
24. Define isomerism. Discuss (i) Geometrical isomerism (ii)Position isomerism (2 Times)
Ans: (Text Book Page No:131)

2018

25. Define alicyclic compounds and aromatic compounds with one example in each case.
Ans: (Text Book Page No:124+125)

CHAPTER NO:8 OBJECTIVES (MCQ'S) ALIPHATIC HYDROCARBON IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 8.3: Nomenclature:

1- Formula of Marsh gas is:
(a) CH_4 (b)C_2H_6 (c)C_3H_8 (d) C_4H_{10}

Topic No: 8.3.4: Reactions of Alkanes:

2. Which types of reactions are given by alkanes?
(a) Polymerization (b) Elimination (c) Substitution (d) Addition (8 times)
3. Formula of Chloroform is:
(a) CH_3Cl (b) CH_2Cl_2 (c) $CHCl_3$ (d) CCl_4
4. The catalytic oxidation of methane produces:
(a) $CO + H_2O$ (b) $CO_2 + H_2O$ (c) $C + H_2O$ (d) H_3C-OH
5- $CH_4+Cl_2 \xrightarrow[\text{Sunlight}]{\text{Diffused}}$ Product is:
(A) Chloroform only (B) Carbon tetra chloride only (C) $CH_3C\ell_2$ (D) Mixture of A, B, C

Topic No: 8.4.4: Alkenes:

6. Preparation of vegetable ghee involves: (5 times)
(a)Halogenation (b) Hydrogenation (c)Hydroxylation (d)Dehydrogenation
7. The addition of unsymmetrical reagent to an unsymmetrical alkene is in accordance with the rule: (2 Times)
(a)Hund's rule (b) Markownikow's rule (c) Pauli's Exclusive rule (d) Aufbau Principle
8. The presence of double bond in a compound is the sign of: (2 times)
(a) Saturation (b) Unsaturation (c) Substitution (d) None of these
9. Vegetable oils are:
(a) Polyesters (b) Glycerides of unsaturated fatty acids
(c) Essential oils (d) Fatty acid

Topic No: 8.4.5: Uses of Alkenes:

10. Mustard gas is obtained by the reaction of S_2Cl_2 with:
(a) Ethane (b) Ethene (c) Ethyne (d) Methane

11. Which is used for artificial ripening of fruits? **(2 times)**

(a) Ethane (b) Ethene (c) Acetylene (d) Propane

12. β, β – dichloro ethyl sluphide is commonly known as: **(5 times)**

(a) Mustard gas (b) Laughing gas (c) Bio-gas (d) Phosgene gas

Topic No: 8.5.4: Alkynes:

13. Synthetic rubber is made by polymerization of: **(11 times)**

(a) Chloroform (b) Acetylene (c) Divinyl acetylene (d) Chloroprene

14. Vinyl acetylene combine with hydrochloric acid to form: **(17 times)**

(a) Polyacetylene (b) Benzene (c) Chloroprene (d) Divinyl acetylene

15. Which compound has acidic hydrogen:

(a) butane (b) 1- butene (c) 1 – butyne (d) 2 – butyne

Topic No: 8.5.6: Comparison of Reactivities:

16- Which compound is most reactive: **(2 times)**

(a) Benzene (b) Ethane (c) Ethyne (d) Ethene

17- Which compound is the least reactive one?

(a) Benzene (b) Ethene (c) Ethane (d) Ethynes

2019

18. Conversion of unsaturated hydro carbons to saturated hydrocarbons in the presence of catalyst is called as:

(a) halogenation (b) hydrogenation (c) hydroxylation (d) dehydrogenation

19. Structural formula of vinyl chloride is:

(a) $HC \equiv C - Cl$ (b) $H_2C = CHCl$ (c) $H_3C - CHCl_2$ (d) $\underset{Cl}{\underset{|}{H_2C}} - \underset{Cl}{\underset{|}{CH_2}}$

20. When 1.chloropropane is reacted with alcoholic KOH, the product obtained is:

(a) Propane (b) Propene (c) Propyne (d) Butane

2021

21. The presence of a double bond in a compound is the sign of:

(a) saturation (b) unsaturation (c) substitution (d) none

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	C	C	D	D	B	B	B	B	B	B	A	D	C
15	16	17	18	19	20	21							
C	D	C	B	B	B	B							

CHAPTER NO:8 SHORT QUESTIONS ALIPHATIC HYDROCARBON IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 8.2.3: Nomenclature:

1 How common names of alkenes are derived? Give common names of $CH_2=CH_2$ and CH_3-$CH=CH_2$?

Ans: For alkanes, the word is derived from the Greek or Latin numerals indicating the number of carbon atoms in a molecule, and the name is completed by adding ane as a suffix. Alkenes are similarly named by replacing the ending – "ane" of the name of alkane with "ylene".

For example: $CH_2=CH_2$ has name Ethylene and CH_3-$CH=CH_2$ Propylene.

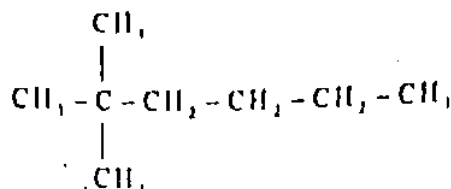
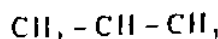
2 Write down the structural formula of the given compounds;

i). 2-2-Dimethyl Hexane ii). 4-iso-propyl heptane

Ans: Structural formula of compounds;

i). 2-2-Dimethyl Hexane:

$$CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_2-CH_2-CH_2-CH_3$$

ii). 4-iso-propyl heptane:

$$CH_3-CH_2-CH_2-\underset{}{\overset{CH_3-CH-CH_3}{\overset{|}{CH}}}-CH_2-CH_2-CH_3$$

3 Write structural formulas of (i).. 1,3-Pentadiene (ii) Vinyl bromide

Ans: (i).. 1,3-Pentadiene CH_3-CH=CH-CH=CH_2

(ii) Vinyl bromide CH_2=CH-Br

4 Draw structure of (a) 2-Methyl-2-butene (b) 5-Methyl-2-hexene

Ans (a)

$$\overset{CH_3}{\overset{|}{CH_3}}-CH=CH-CH_3$$

2-Methyl-2-butene

(b)

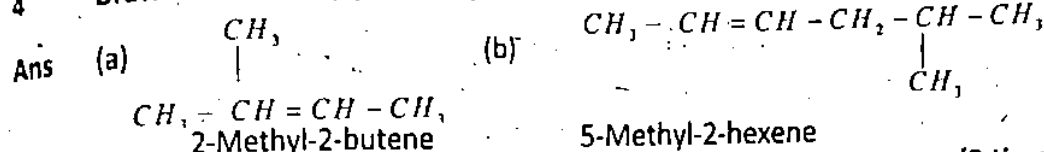
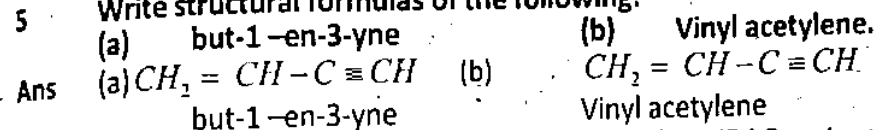
$$CH_3-CH=CH-CH_2-\underset{CH_3}{\underset{|}{CH}}-CH_3$$

5-Methyl-2-hexene

5 Write structural formulas of the following: (2 times)

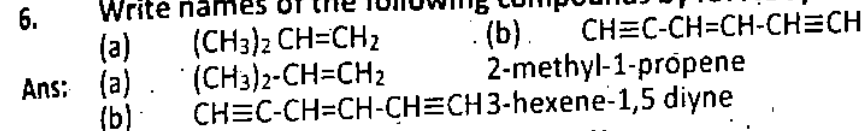
(a) but-1 –en-3-yne (b) Vinyl acetylene.

Ans (a) $CH_2=CH-C\equiv CH$ (b) $CH_2=CH-C\equiv CH$

but-1 –en-3-yne Vinyl acetylene

6. Write names of the following compounds by IUPAC system.

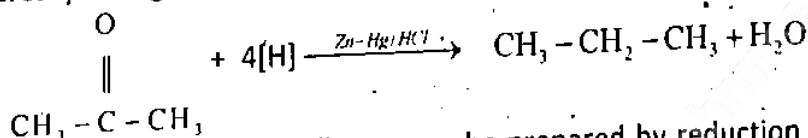
(a) $(CH_3)_2$ CH=CH_2 (b) CH≡C-CH=CH-CH≡CH

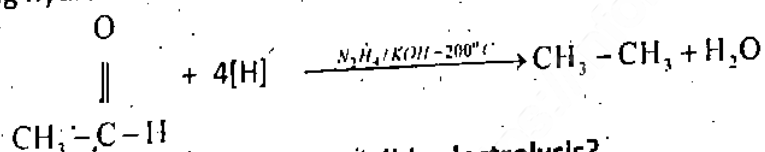
Ans: (a) $(CH_3)_2$-CH=CH_2 2-methyl-1-propene

(b) CH≡C-CH=CH-CH≡CH 3-hexene-1,5 diyne

Topic No: 8.3.1: Preparation of Alkanes:

7. Prepare alkanes from Clemmensen and Wolf-Kishner's reduction methods from aldehyde or ketone? (8 times)

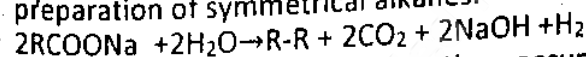
Ans: Clemmensen reduction: Alkanes can be prepared by reduction of ketone by using zinc mercury amalgam and hydrochloric acid.

$$CH_3-\overset{O}{\overset{\|}{C}}-CH_3 + 4[H] \xrightarrow{Zn-Hg/HCl} CH_3-CH_2-CH_3+H_2O$$

Wolf-Kishner's reduction: Alkanes can be prepared by reduction of aldehyde by using hydrazine in the presence of KOH.

$$CH_3-\overset{O}{\overset{\|}{C}}-H + 4[H] \xrightarrow{N_2H_4/KOH-200^{\circ}C} CH_3-CH_3+H_2O$$

8. How ethane can be prepared by Kolb's electrolysis? (3 times)

Ans: Preparation of ethane by Kolb's electrolysis:-

When a concentrated solution of sodium or potassium salt of a mono carboxylic acid is electrolyzed, an alkane is produced, this method is only suitable for the preparation of symmetrical alkanes.

$2RCOONa + 2H_2O \rightarrow R\text{-}R + 2CO_2 + 2NaOH + H_2$

During electrolysis following reactions occur at anode and cathode.

Topic No: 8.3.2: Physical Properties:

9. What is effect of branching on boiling points of alkanes? (2 times)

Ans: The boiling points of alkanes having branced chain structures are lower than their isomeric normal chain alkanes, e.g. n-butane has a higher boiling point (-0.5 °C) than isobutene (-117 °C).

Topic No: 8.3.3: Reactivity of Alkanes:

10. The sigma bonds are inert in alkanes. Explain?

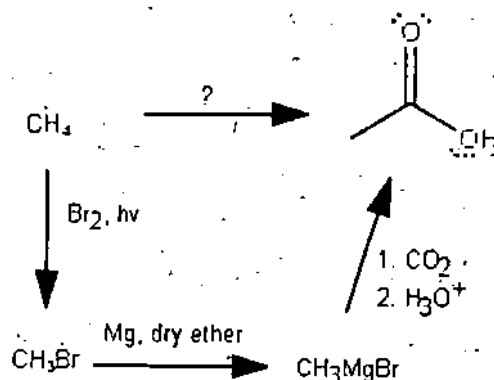
Ans: In a σ-bond the electrons are very tightly held between the nuclei which make it very stable bond. A lot of energy is required to break it.
The alkanes or paraffins (Latin: parum= little, affins = affinity) under ordinary condition are inert towards acids, alkalis, oxidizing and reducing agents.

11. Sigma bonds are inert in alkanes. Justify. **(2 times)**

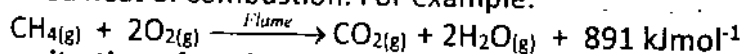
Ans: In a σ – bond the electrons are very tightly held between the nuclei which makes it a very stable bond. A lot of energy is required to break it. Moreover, the electrons present in a sigma bond can neither attack on any electrophile nor a nucleophile can attack on them. Both these facts make alkanes less reactive.

Topic No: 8.3.4: Reactions of Alkanes:

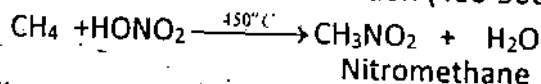
12. How will you convert methane into ethanoic acid?

Ans: Conversion of methane:

13. What is heat of combustion? **(2 times)**

Ans: Heat of combustion:- Burning of an alkane in presence of oxygen is known as combustion. Complete combustion of an alkene yields CO_2, H_2O and heat. The amount to heat evolved when one mole of a hydrocarbon is burnt to CO_2 and H_2O is called heat of combustion. For example:

$$CH_{4(g)} + 2O_{2(g)} \xrightarrow{Flame} CO_{2(g)} + 2H_2O_{(g)} + 891\ kJmol^{-1}$$

14. Describe nitration of methane. **(2 Times)**

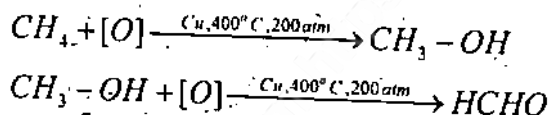
Ans: Nitration of methane:It is substitution reaction of alkanes in which a hydrogen atom of an alkane is replaced by nitro group ($-NO_2$). Alkanes undergo vapour – phase nitration under drastic condition (400-500 °C) to give nitroalkanes e.g.

$$CH_4 + HONO_2 \xrightarrow{450^\circ C} \underset{\text{Nitromethane}}{CH_3NO_2} + H_2O$$

Nitroalkanes generally find use as fuel, solvents and in organic synthesis.

15. Convert CH_4 to CH_2O. / Convert CH_4 into formaldehyde by catalytic oxidation. **(4 times)**

Ans: Conversion ofCH_4 to CH_2O:

$$CH_4 + [O] \xrightarrow{Cu, 400^\circ C, 200 atm} CH_3 - OH$$

$$CH_3 - OH + [O] \xrightarrow{Cu, 400^\circ C, 200 atm} HCHO$$

Topic No: 8.3.5: Uses of Methane:

16. Give four uses of methane? **(4 times)**

Ans: Methane is used:

(i).. as a fuel and as an illuminating gas.

(ii).. for the preparation of methyl chloride, methylene chloride, chloroform and carbon tetrachloride.

(iii).. for the industrial preparation of methyl alcohol, formaldehyde and hydrogen cyanide.

(iv).. for the preparation of carbon black used in paints, prints, printing inks and automobiles tyres.

Topic No: 8.4: Alkenes:

17. Why are alkenes also called olefins?

Ans Alkenes also known as olefins(derived from Latin word olefiant meaning oil forming) because its lower members form oily products on treatment with chlorine or bromine.

18. **Write structural formulas of following: (1). Vinyl bromide (2)... Isobutylene. (2 times)**

Ans: (1).. **Vinyl bromide:** $CH_2=CH-Br$

(2)... **Isobutylene.:**

$$CH_3-\underset{}{\overset{CH_3}{\overset{|}{C}}}=CH_2$$

19. **Why are some hydrocarbons called saturated and other unsaturated?**

Ans: Those compounds in which the four valencies of carbon atoms are satisfied by single bonds to either other carbon atoms or hydrogen atoms are called saturated hydrocarbons. For example alkanes are saturated hydrocarbons.

Those compounds in which the four valencies of carbon atoms are not satisfied by single bonds, however, satisfied by double or triple bond are called un-saturated hydrocarbons. For example alkenes and alkynes are un-saturated hydrocarbons.

20. **Convert methane to ethane? (2 times)**

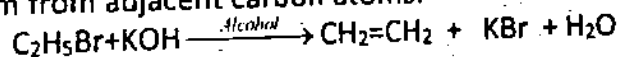
Ans: $CH_4 + Cl_2 \xrightarrow{Light, -HCl} CH_3Cl$

$CH_3Cl + Na + CH_3Cl \rightarrow CH_3 - CH_3 + 2NaCl$

21. **Starting from C_2H_5Br how will you prepare ethane and ethene.**

Ans: __Ethane:__ Alkanes also be prepared from alkyl halids using palladium charcoal as a catalyst. The method is known as Hydrogenolysis (hydrogenation accompanied by bond cleavage). $C_2H_5Br \xrightarrow{Pd/C, \Delta} C_2H_6 + HBr$

__Ethene:__ Alkyl halides on heating with alcoholic potassium hydroxide undergo dehydrohalogenation i.e. elimination of a halogen atom together with a hydrogen atom from adjacent carbon atoms.

$$C_2H_5Br + KOH \xrightarrow{Alcohol} CH_2=CH_2 + KBr + H_2O$$

__Topic No: 8.4.3: Reactivity:__

22. **Why π-bond is more reactive than σ-bond? / Discuss reactivity of π – bond. (2 Times)**

Ans: __π-bond is more reactive than σ -bond:-__

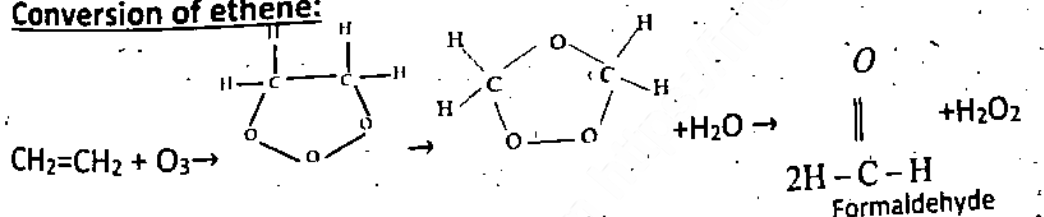
In the formation of a π-bond, the partially filled p-orbitals overlap in a parallel fashion, the probability of finding electron is thus away from the line joining the two nuclei, due to this reason π-electrons are less firmly held between the nuclei. A π-bond is, therefore, a weak bond as compared to a σ-bond. During the reaction it breaks comparatively easily rendering alkenes as reactive group of compounds.

__Topic No: 8.4.4: Reactions of Alkenes:__

23. **How will you convert ethene into formaldehyde.**

Ans: __Conversion of ethene:__

$$CH_2=CH_2 + O_3 \rightarrow \text{(Molozonide)} \rightarrow \text{(Ozonide)} + H_2O \rightarrow 2H-\overset{O}{\overset{\|}{C}}-H + H_2O_2$$

Ethen Molozonide Ozonide Formaldehyde

24. **How ethylene is converted into? (a) Ethylene oxide (b) Ethylene glycol**

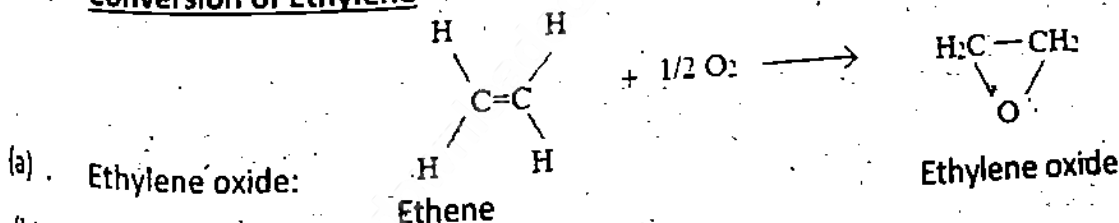
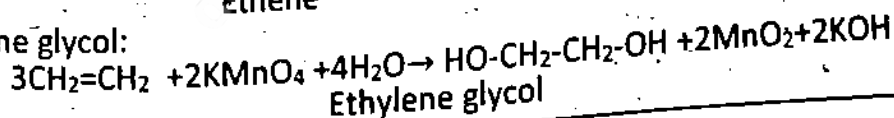
Ans: __Conversion of Ethylene__

(a). Ethylene oxide:

$$H_2C=CH_2 + 1/2\, O_2 \longrightarrow H_2C-CH_2 \text{ (bridged by O)}$$

Ethene Ethylene oxide

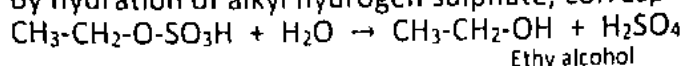
(b) Ethylene glycol:

$$3CH_2=CH_2 + 2KMnO_4 + 4H_2O \rightarrow HO\text{-}CH_2\text{-}CH_2\text{-}OH + 2MnO_2 + 2KOH$$

Ethylene glycol

25. Ethene can be converted into ethyl alcohol. Write equation. (5 times)

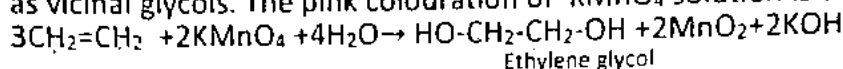
Ans: When ethane is treated with cold concentrated sulphuric acid, they are dissolved because they react by addition to form alkyl hydrogen sulphate. For example,

$$CH_2=CH_2 + H_2SO_4 \rightarrow \underset{\text{Alkyl hydrogen sulphate}}{CH_3-CH_2-O-SO_3H}$$

By hydration of alkyl hydrogen sulphate, corresponding alcohol is produced.

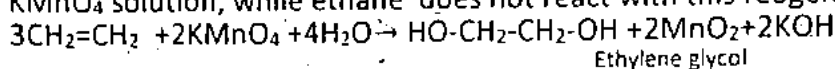
$$CH_3-CH_2-O-SO_3H + H_2O \rightarrow \underset{\text{Ethy alcohol}}{CH_3-CH_2-OH} + H_2SO_4$$

26. What is Baeyer's test? What is its uses? (8 times)

Ans: <u>Baeyer's test:-</u>When alkenes are treated with mild oxidizing reagents like dilute alkaline $KMnO_4$ solution (Bayer's Reagent) at low temperature, hydroxylation of double bond occurs resulting in the formation of dihydroxy compounds known as vicinal glycols. The pink colouration of $KMnO_4$ solution is discharged.

$$3CH_2=CH_2 + 2KMnO_4 + 4H_2O \rightarrow \underset{\text{Ethylene glycol}}{HO-CH_2-CH_2-OH} + 2MnO_2 + 2KOH$$

Uses:It is a test for the presence of unsaturation in the molcules.

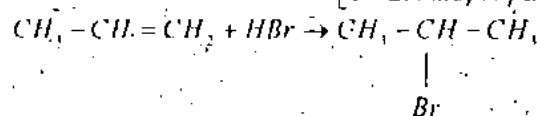
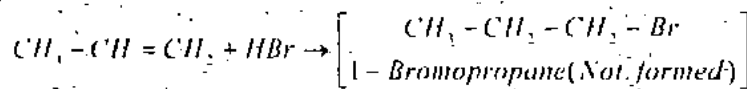
27. Describe how we can be distinguish between ethane ðene? (4 times)

Ans: <u>Test for ethane and ethane:-</u>Ethene immediately decolourise the pink colour of $KMnO_4$ solution, while ethane does not react with this reagent.

$$3CH_2=CH_2 + 2KMnO_4 + 4H_2O \rightarrow \underset{\text{Ethylene glycol}}{HO-CH_2-CH_2-OH} + 2MnO_2 + 2KOH$$

28. Explain Markownikov's rule with one example? (18 times)

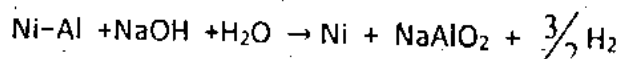
Ans: <u>Markownikov's rule:-</u>In the addition of an unsymmetrical reagent to an unsymmetrical alkene, the negative part of the adding reagent goes to that carbon, constituting the double bond, which has least number of hydrogen atoms is calledMarkownikov's rule.

Example:

$$CH_3-CH=CH_2 + HBr \rightarrow \begin{bmatrix} CH_3-CH_2-CH_2-Br \\ 1-Bromopropane(Not.formed) \end{bmatrix}$$

$$CH_3-CH=CH_2 + HBr \rightarrow \underset{\substack{2-bromopropane \\ (Actual..product)}}{CH_3-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_3}$$

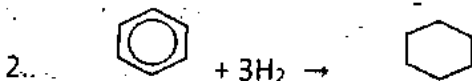
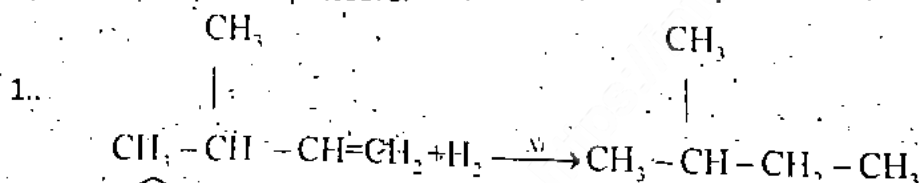
29. Define Rany nickel. Give its uses? (7 times)

Ans: <u>Rany nickel:-</u> Rany nickel is a catalyst which is prepared by treating a Ni-Al alloy with caustic soda as:

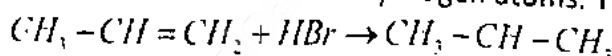
$$Ni-Al + NaOH + H_2O \rightarrow Ni + NaAlO_2 + \frac{3}{2}H_2$$

Uses: Most alkenes are hydrogenated over Raney nickel at about 100ºC and upto 3-atmospheres pressure.

1.

$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH=CH_2 + H_2 \xrightarrow{Ni} CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_3$$

2. (benzene) + $3H_2$ → (cyclohexane)

30. Identify the actual product,whenHBr is added to propene. Write equation also.

Ans: Propene is an unsymmetrical alkene. According to Markovnikov's rule, the negative part of the adding reagent goes to that carbon, constituting the double bond, which has least number of hydrogen atoms. The actual product will be.

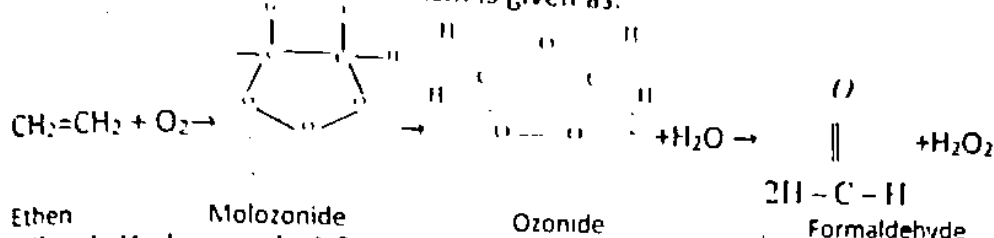
$$CH_3-CH=CH_2 + HBr \rightarrow \underset{2-bromopropane}{CH_3-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_3}$$

31. Define hydrogenation? Give its two applications. / What is Sabatier-Senden's reaction ? Give its industrial importance. **(2 Times)**

Ans: **Hydrogenation:-**Hydrogenation is a process in which a molecule of hydrogen is added to an alkene in the presence of a catalyst and at moderate pressure (1-5 atm) to give a saturated compound. It is a highly exothermic process and the amount of heat evolved when one mole of an alkene is hydrogenated is called Heat of Hydrogenation. Hydrogenation reaction is catalyzed by some catalysts like Pt, Pd and Raney nickel.

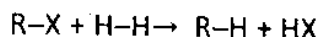
32 Give the mechanism of ozonolysis of ethene? **(5 times)**

Ans: Ozone is highly reactive allotropic form of oxygen. It reacts vigorously with alkenes to form unstable molozonide. It rearrange spontaneously to form an ozonide. The reaction mechanism is given as:

$CH_2=CH_2 + O_3 \rightarrow$ Molozonide $\rightarrow$ Ozonide $+ H_2O \rightarrow 2H-C(=O)-H + H_2O_2$

Ethen Molozonide Ozonide Formaldehyde

33. What is Hydrogenolysis? Give an example. **(6 times)**

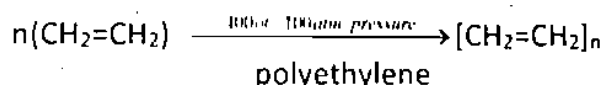
Ans: **Hydrogenolysis:-**Hydrogenation along with bond cleavage is called Hydgrogenolysis. This reaction takes place in presence of heated palladium charcoal catalyst. E.g.

$$R-X + H-H \rightarrow R-H + HX$$

34. Describe polymerization of ethene.

Ans: In this process small organic molecules (monomers) combine together to form larger molecules known as polymers.

Ethene at 400°C and 100atm pressure, polymerization to polythene or polyethylene.

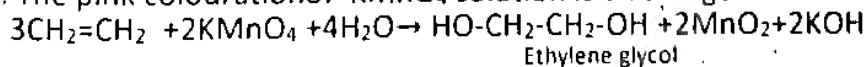
$$n(CH_2=CH_2) \xrightarrow{400°C,\ 100atm\ pressure} [CH_2=CH_2]_n$$

polyethylene

A good quality polythene is obtained, when ethane is polymerized in the presence of aluminium triethyl ($Al(C_2H_5)_3$) and titanium tetrachloride catalysts ($TiCl_4$).

35. Describe a test for the presence of unsaturation in organic molecules. / Define Hydroxylation. Give an example. **(2 Times)**

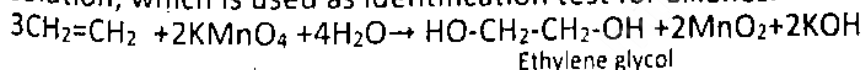
Ans: When alkenes are treated with mild oxidizing reagents like dilute alkaline $KMnO_4$ solution (Bayer's Reagent) at low temperature, hydroxylation of double bond occurs resulting in the formation of dihydroxy compounds known as vicinal glycols. The pink colourationof $KMnO_4$ solution is discharged.

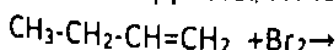
$$3CH_2=CH_2 + 2KMnO_4 + 4H_2O \rightarrow HO-CH_2-CH_2-OH + 2MnO_2 + 2KOH$$

Ethylene glycol

36. Write two identification tests of akenes.

Ans (i). **Bayer's Test:** Ethene immediately decolourise the pink colour of $KMnO_4$ solution, which is used as identification test for alkenes.

$$3CH_2=CH_2 + 2KMnO_4 + 4H_2O \rightarrow HO-CH_2-CH_2-OH + 2MnO_2 + 2KOH$$

Ethylene glycol

(ii).**Bromine water test:** When alkenes react with bromine water its brown colour disappears. Which is used for the identification test for alkenes.

$$CH_3-CH_2-CH=CH_2 + Br_2 \rightarrow CH_3-CH_2-CH(Br)-CH_2-Br$$

37. How will you prepare following compounds from ethene?

(a) ethyl alcohol **(b) ethylene epoxide**

Ans (a) When etheneis treated with cold concentrated sulphuric acid, they are dissolved because they react by addition to form alkyl hydrogen sulphate. For example,

$$CH_2=CH_2 + H_2SO_4 \rightarrow CH_3-CH_2-O-SO_3H$$

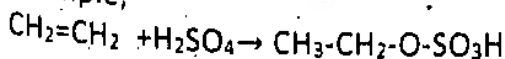
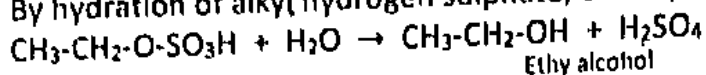
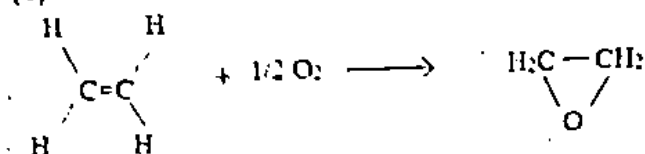
Alkyl hydrogen sulphate

By hydration of alkyl hydrogen sulphate, corresponding alcohol is produced.

$CH_3\text{-}CH_2\text{-}O\text{-}SO_3H + H_2O \rightarrow CH_3\text{-}CH_2\text{-}OH + H_2SO_4$

Ethy alcohol

(b)

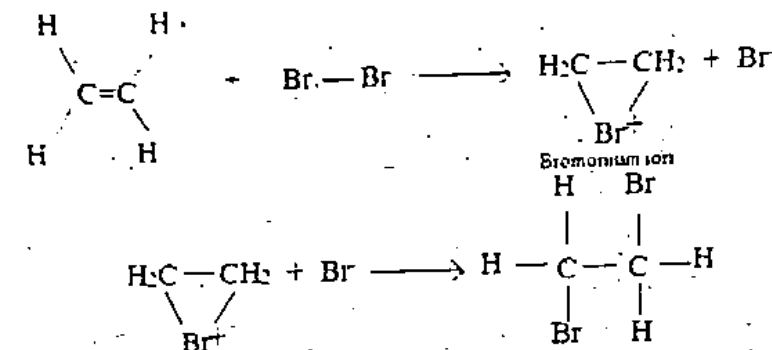
$H_2C{=}CH_2 + 1/2\,O_2 \longrightarrow H_2C-CH_2$ (with O bridging)

Ethene — Ethylene epoxide

38. Give the mechanism of bromination of ethene. **(3 times)**

Ans

$H_2C{=}CH_2 + Br-Br \longrightarrow H_2C-CH_2$ (bridged Br^+) $+ Br^-$

Bromonium ion

H_2C-CH_2 (bridged Br^+) $+ Br^- \longrightarrow H-C(H)(Br)-C(Br)(H)-H$

Topic No: 8.4.5: Uses of Ethene:

39. Mention four uses of ethene. **(2 times)**

Ans: Ethene is used:

(i). for the manufacture of polythene, a plastic material used of making toys, cables, bags, boxes, etc.

(ii). for a artificial ripening of the fruits.

(iii). as a general anesthetic.

(iv). for preparing 'Mustard gas' a chemical used in Word War I, the name comes from its mustard like odour, it is not a gas, but a high boiling liquid that is dispersed as a mist of tiny droplets.

Topic No: 8.5; Alkynes:

40. Write structural formulas for two compound; (i). Vinyl acetylene (ii).But-3-en-yne

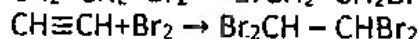
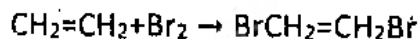
Ans: (i).. Vinyl acetylene : $CH_2{=}CH\text{-}C{\equiv}CH$

(ii).. 1-Butene-3-yne: $CH_2{=}CH\text{-}C{\equiv}CH$

41. Distinguish between Ethene and Acetylene?

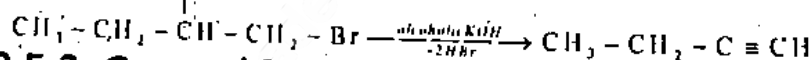
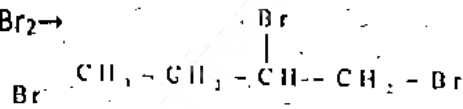
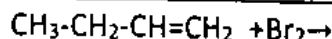
Ans: **Difference of Ethene and Acetylene:-**Ethene discharges colour of Br_2 immediately while acetylene reacts slowly with Br_2 and colour of Br_2 is discharged in few minutes.

$CH_2{=}CH_2 + Br_2 \rightarrow BrCH_2{=}CH_2Br$

$CH{\equiv}CH + Br_2 \rightarrow Br_2CH - CHBr_2$

42. How will you convert 1-butene to 1-butyne? **(3 times)**

Ans: **Conversion of 1-butene to 1-butyne**

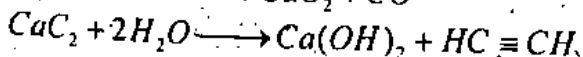
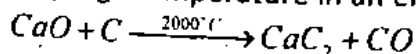
$CH_3\text{-}CH_2\text{-}CH{=}CH_2 + Br_2 \rightarrow CH_3-CH_2-CH(Br)-CH_2-Br$

$CH_3-CH_2-CH(Br)-CH_2-Br \xrightarrow[-2HBr]{alcoholic\ KOH} CH_3-CH_2-C\equiv CH$

Topic No: 8.5.3: General Preparation Methods:

43. How can ethyne be prepared commercially from calcium carbide? (2 Times)

Ans: On industrial scale ethyne is prepared by the reaction of calcium carbide (CaC_2) with water. Calcium carbide is prepared by heating lime (CaO) and coke (C) at a very high temperature in an electric furnace.

$$CaO + C \xrightarrow{2000^\circ C} CaC_2 + CO$$

$$CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + HC \equiv CH$$

44. Why Alkynes are less reactive than alkenes towards Electrophilic Regents?

Ans: A π-bond in alkenes is not only weak but its electrons are more expose to an attack by an electrophilic reagent. Both these acts make the alkenes a very reactive class of compounds. Alkynes although contain two π-bond are less reactive than alkenes towards electrophilic reagents this is because the bond distance between the two triple bonded carbon atoms is very short and hence the π-electrons are not available to be attacked by electrophilic reagents.

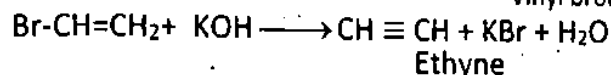
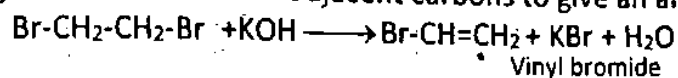
Topic No: 8.5.4: Reactions:

45. How are alkynes prepared from vicinal dihalides?

Ans: **Preparation of Alkyne:**

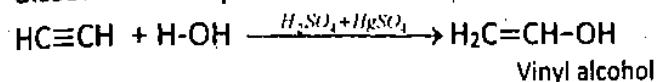
Vicinaldihalide on treating with a strong base eliminates two molecules of hydrogen halides from two adjacent carbons to give an alkyne.

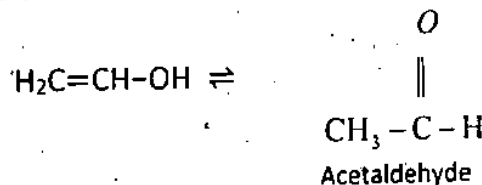
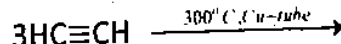
$$Br\text{-}CH_2\text{-}CH_2\text{-}Br + KOH \longrightarrow \underset{\text{Vinyl bromide}}{Br\text{-}CH{=}CH_2} + KBr + H_2O$$

$$Br\text{-}CH{=}CH_2 + KOH \longrightarrow \underset{\text{Ethyne}}{CH \equiv CH} + KBr + H_2O$$

46. How ethyne (actylene) is converted to (a). Acetaldehyde (b) Benzene? (6 times)

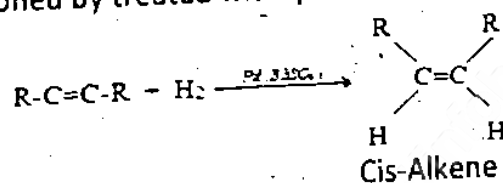
Ans: Conversion of ethyne is in to

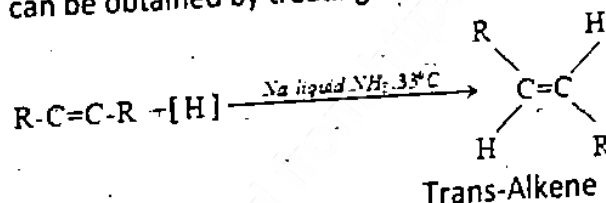
(a).. **Acetaldehyde:** Water adds to ethyne in the presence of mercuric sulphate dissolved in sulphuric acid at 75ºC.

$$HC{\equiv}CH + H\text{-}OH \xrightarrow{H_2SO_4 + HgSO_4} \underset{\text{Vinyl alcohol}}{H_2C{=}CH\text{-}OH}$$

Vinyl alcohol is an unstable enole. The enol has the hydroxy group attached to a double bonded carbon atom and isomerises to acetaldehyde.

$$H_2C{=}CH\text{-}OH \rightleftharpoons \underset{\text{Acetaldehyde}}{CH_3-\overset{\overset{O}{\|}}{C}-H}$$

(b).. **Benzene:-** $3HC{\equiv}CH \xrightarrow{300°C, Cu\text{-}tube}$ (benzene)

47 How Cis and Trans Alkenes are obtained from Alkynes? (3 times)

Ans: Controlled hydrogenation of alkynes with hydrogen gas in an equimolar ratio over heated catalysts, gives alkenes. The catalyst is finely divided palladium supported on $BaSO_4$ and poisoned by treated with quinolone (Lindlar's catalyst).

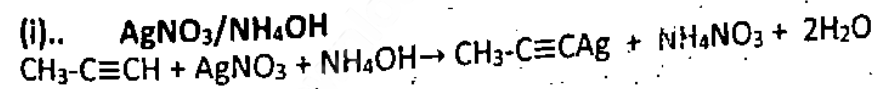
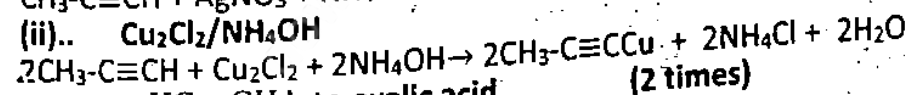
$$R\text{-}C{\equiv}C\text{-}R + H_2 \xrightarrow{Pd/BaSO_4} \underset{\text{Cis-Alkene}}{(R)(H)C{=}C(R)(H)}$$

A trans alkene can be obtained by treating an alkyne with Na in liquid NH_3 at -33 °C.

$$R\text{-}C{\equiv}C\text{-}R + [H] \xrightarrow{Na\ liquid\ NH_3, -33°C} \underset{\text{Trans-Alkene}}{(R)(H)C{=}C(H)(R)}$$

48 How does propyne react with :(i).. $AgNO_3/NH_4OH$ (ii).. Cu_2Cl_2/NH_4OH (2 Times)

Ans: (i).. $AgNO_3/NH_4OH$

$$CH_3\text{-}C{\equiv}CH + AgNO_3 + NH_4OH \rightarrow CH_3\text{-}C{\equiv}CAg + NH_4NO_3 + 2H_2O$$

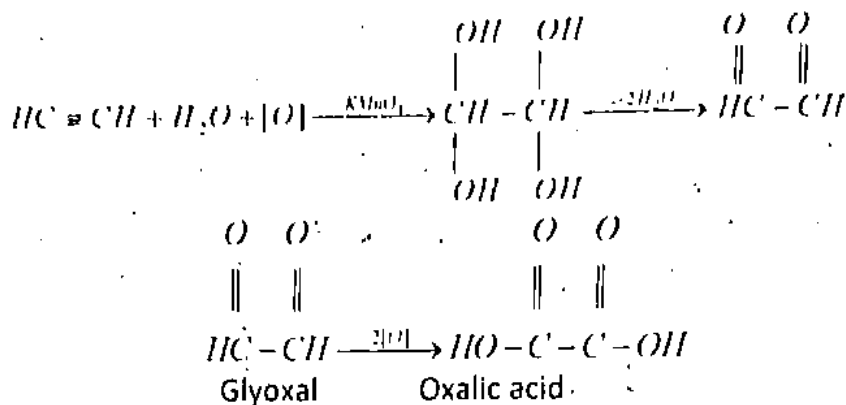
(ii).. Cu_2Cl_2/NH_4OH

$$2CH_3\text{-}C{\equiv}CH + Cu_2Cl_2 + 2NH_4OH \rightarrow 2CH_3\text{-}C{\equiv}CCu + 2NH_4Cl + 2H_2O$$

49 Convert $HC \equiv CH$ into oxalic acid. (2 times)

Ans: **Conversion of $HC \equiv CH$ into oxalic acid:**

$$HC\equiv CH + H_2O + [O] \xrightarrow{KMnO_4} \underset{OH\ \ OH}{\overset{OH\ \ OH}{CH-CH}} \xrightarrow{-2H_2O} \overset{O\ \ \ O}{\overset{\|\ \ \ \|}{HC-CH}}$$

$$\overset{O\ \ \ O}{\overset{\|\ \ \ \|}{HC-CH}} \xrightarrow{2[O]} \overset{O\ \ \ O}{\overset{\|\ \ \ \|}{HO-C-C-OH}}$$

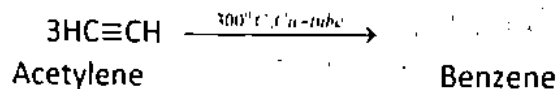
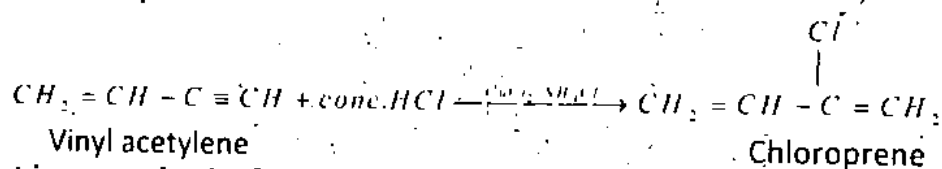
Glyoxal Oxalic acid

50. How will you synthesize following compounds from ethyne.: (a) Benzene (b) Chloroprene.

Ans: (a). **Benzene:-**When acetylene is passed through a copper tube at 300°C it polymerizes to benzene.

$$3HC\equiv CH \xrightarrow{300^\circ C, Cu-tube}$$

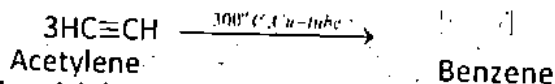
Acetylene Benzene

(b).. Chloroprene:-

$$CH_2=CH-C\equiv CH + conc.HCl \xrightarrow{Cu_2Cl_2, NH_4Cl} CH_2=CH-\overset{Cl}{\overset{|}{C}}=CH_2$$

Vinyl acetylene Chloroprene

51. What is aromatization?

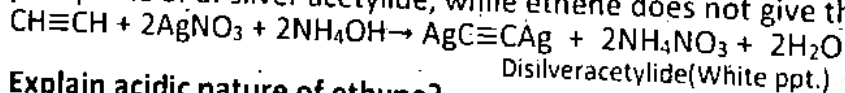
Ans: **Aromatization:**To develop aromatic character in cyclic rings is called aromatization.

$$3HC\equiv CH \xrightarrow{300^\circ C, Cu-tube}$$

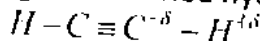
Acetylene Benzene

52. Distinguish between ethane & ethyne by a chemical test? (3 times)

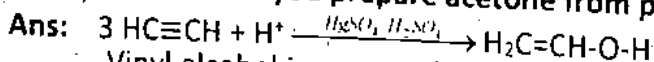
Ans: When ethyne passed through ammonical solution of $AgNO_3$, it forms white precipitate of di-silver acetylide, while ethene does not give this test.

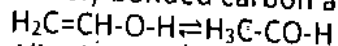
$CH\equiv CH + 2AgNO_3 + 2NH_4OH \rightarrow AgC\equiv CAg + 2NH_4NO_3 + 2H_2O$

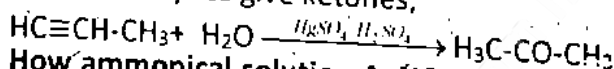
Disilveracetylide(White ppt.)

53. Explain acidic nature of ethyne? (2 Times)

Ans: Acidic nature of ethyneInethyne, the hydrogen atom is bonded to the carbon atom with sp-s overlap. The sp hybridized carbon atom of ethyne pulls the electrons more strongly making the attached hydrogen atom slightly acidic as:

$$H-C\equiv C^{-\delta}-H^{+\delta}$$

54. How would you prepare acetone from propyne.

Ans: $3\ HC\equiv CH + H^+ \xrightarrow{HgSO_4, H_2SO_4} H_2C=CH\text{-}O\text{-}H$

Vinyl alcohol is an unstable enol. The enol has the hydroxyl group attached to a doubly bonded carbon atom and isomerizes to acetaldehyde.

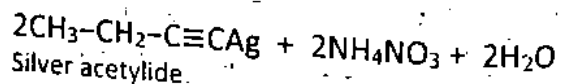
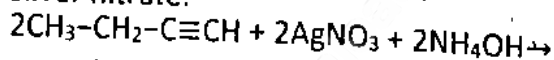
$H_2C=CH\text{-}O\text{-}H \rightleftharpoons H_3C\text{-}CO\text{-}H$

All other alkynes give ketones;

$HC\equiv CH\text{-}CH_3 + H_2O \xrightarrow{HgSO_4, H_2SO_4} H_3C\text{-}CO\text{-}CH_3$

55. How ammonical solution $AgNO_3$ can be used distinguish between 1-Butyne and 2-Butyne?

Ans: When 1-butyne is treated with ammonical solution of silver nitrate white precipitates are formed but 2-butyne does not react with ammonical solution of silver nitrate.

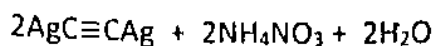
$2CH_3-CH_2-C\equiv CH + 2AgNO_3 + 2NH_4OH \rightarrow$

$2CH_3-CH_2-C\equiv CAg + 2NH_4NO_3 + 2H_2O$

Silver acetylide

56. Write two identification tests of 1- Alkynes.

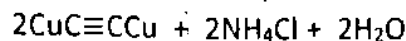
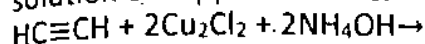
Ans (i) When 1-alkyne is treated with ammonical solution of silver nitrate white precipitates are formed but other alkynes does not react with ammonical solution of silver nitrate.

$HC\equiv CH + 2AgNO_3 + 2NH_4OH \rightarrow$

$2AgC\equiv CAg + 2NH_4NO_3 + 2H_2O$

Disilveracetylide(White ppt.)

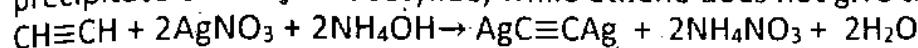
(ii) When 1-alkyne is treated with ammonical solution of copper chloride reddish brown precipitates are formed but other alkynes does not react with ammonical solution of copper chloride.

$HC\equiv CH + 2Cu_2Cl_2 + 2NH_4OH \rightarrow$

$2CuC\equiv CCu + 2NH_4Cl + 2H_2O$

Dicopperacetylide (Reddish brown ppt.)

57. How does ethyne react with ammonical silver nitrate?

Ans: When ethyne passed through ammonical solution of $AgNO_3$, it forms white precipitate of di-silver acetylide, while ethene does not give this test.

$CH\equiv CH + 2AgNO_3 + 2NH_4OH \rightarrow AgC\equiv CAg + 2NH_4NO_3 + 2H_2O$

Disilveracetylide(White ppt.)

Topic No: 8.6: Comparison of Reactivities:

58. Alkanes are less reactive than alkenes. Comment? **(4 times)**

Ans: The alkanes or paraffins (Latin: parum= little, affins = affinity) under ordinary condition are inert towards acids, alkalis, oxidizing and reducing agents. The un-reactivity of alkanes can also be explained on the basis of inertness of a σ-bond. In a σ-bond the electrons are very tightly held between the nuclei which makes it is very stable bond. A lot of energy is required to break it.

On the other hand alkenes contains π-bond, having partially filled p-orbitals overlap in a parallel fashion. π-electrons are less firmly held between the nulei. In alkenes a π-bond is, therefore, a weak bond as compared to a σ-bond.

59. Why alkenes are more reactive than alkanes and alkynes?

Ans: The unreactivity of alkanes can also be explained on the basis of inertness of a σ-bond. In a σ-bond the electrons are very tightly held between the nuclei which makes it very stable bond. A lot of energy is required to break it.

On the other hand alkenes contains π-bond, having partially filled p-orbitals overlap in a parallel fashion. π-electrons are less firmly held between the nulei. In alkenes a π-bond is, therefore, a weak bond as compared to a σ-bond.

In alkynes, the carbon atoms are held together by a triple bond, a σ-bond and two π-bonds. The electron density between the carbon atoms is very high which draws atoms very close to each other. Electrons in a triple bond are, therefore, less exposed and thus less reactive towards reagents than alkenes.

60. Why ethene is more reactive than ethyne towards addition reactions?

Ans: Ethene contains π-bond, having partially filled p-orbitals overlap in a parallel fashion. π-electrons are less firmly held between the nulei. In ethene a π-bond is a weak bond.

In ethyne, the carbon atoms are held together by a triple bond, a σ-bond and two π-bonds. The electron density between the carbon atoms is very high which draws atoms very close to each other. Electrons in a triple bond are, therefore, less exposed and thus less reactive towards reagents.

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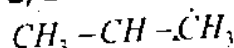
61. Write down the structural formulas of

(a) 2 – Methyl propane (b) Neo pentane

(c) 3 – Ethyl pentane (d) 2, 2 – Dimethyl Pentane

Ans: (a) 2 – Methyl propane

$$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_3$$

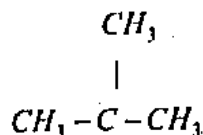
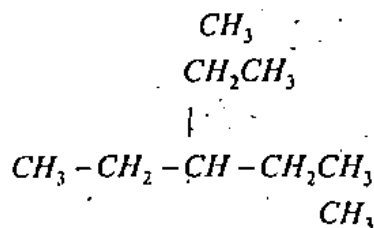
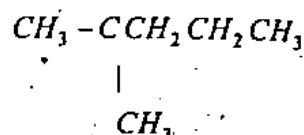
(b) Neo pentane

$$CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\underset{\displaystyle CH_3}{|}}{C}}}-CH_3$$

(c) 3 – ethyl pentane

$$CH_3-CH_2-\overset{\displaystyle CH_2CH_3}{\overset{|}{CH}}-CH_2CH_3$$

(d) 2, 2 – dimethyl pentane

$$CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\underset{\displaystyle CH_3}{|}}{C}}}CH_2CH_2CH_3$$

62. Convert CH_4 to $HCOOH$. / Give the formation of formic acid by catalytic oxidation of alkane. / Discuss Catalytic Oxidation of Methane.

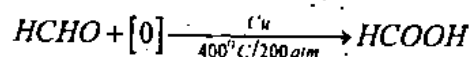
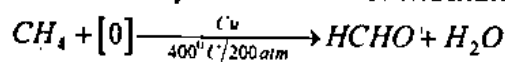
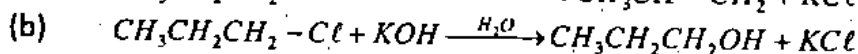
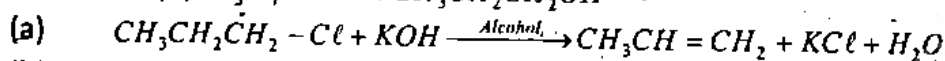
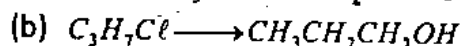
$$CH_4+[O]\xrightarrow[400^0C/200\,atm]{Cu}HCHO+H_2O$$

$$HCHO+[O]\xrightarrow[400^0C/200\,atm]{Cu}HCOOH$$

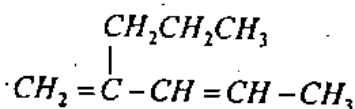
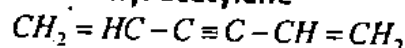
63. Convert (a) $C_3H_7C\ell \longrightarrow CH_3-CH=CH_2$

(b) $C_3H_7C\ell \longrightarrow CH_3CH_2CH_2OH$

(a) $CH_3CH_2CH_2-C\ell+KOH\xrightarrow{Alcohol}CH_3CH=CH_2+KC\ell+H_2O$

(b) $CH_3CH_2CH_2-C\ell+KOH\xrightarrow{H_2O}CH_3CH_2CH_2OH+KC\ell$

64. Write structural formulas of followings. **(3 Times)**

(i)

$2-n-propyl-1,4-pentadiene$

$$CH_2=\overset{\displaystyle CH_2CH_2CH_3}{\overset{|}{C}}-CH=CH-CH_3$$

(ii) **Divinyl acetylene**

$$CH_2=HC-C\equiv C-CH=CH_2$$

65. Write down structural formula of product formed when 1 – butene reacts with Br₂ in $CC\ell_4$

Ans:

$$\underset{1-butene}{CH_3CH_2CH=CH_2}+Br_2\xrightarrow{CC\ell_4}\underset{1,2-dibromobutane}{CH_3CH_2\underset{\underset{\displaystyle Br}{|}}{CH}-\underset{\underset{\displaystyle Br}{|}}{CH_2}}$$

66. Identity A, B and C in the following reaction

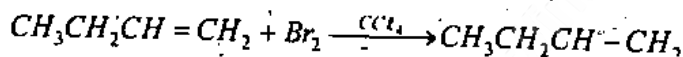
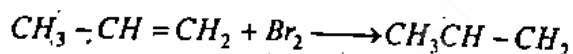
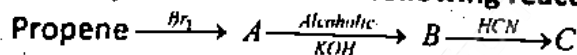
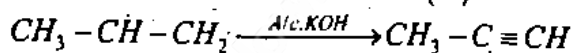
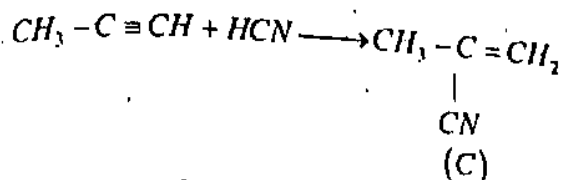
$$\text{Propene}\xrightarrow{Br_2}A\xrightarrow[KOH]{Alcoholic}B\xrightarrow{HCN}C$$

Ans:

$$CH_3-CH=CH_2+Br_2\longrightarrow \underset{\substack{1,2-dibromopropane\\(A)}}{CH_3\underset{\underset{\displaystyle Br}{|}}{CH}-\underset{\underset{\displaystyle Br}{|}}{CH_2}}$$

$$CH_3-\underset{\underset{\displaystyle Br}{|}}{CH}-\underset{\underset{\displaystyle Br}{|}}{CH_2}\xrightarrow{Alc.KOH}\underset{\substack{Propyne\\(B)}}{CH_3-C\equiv CH}$$

$$CH_3-C\equiv CH+HCN\longrightarrow CH_3-\underset{\underset{CN}{|}}{C}=CH_2$$

(C)

67. How non-polarity of alkanes is related to their unreactivity?

Ans: In alkanes both C – H and C – C bond show non-polar character, the ionic reagents such as acids, alkalies, oxidizing agents etc. find no. reaction site in alkane molecule to which they could be attached.

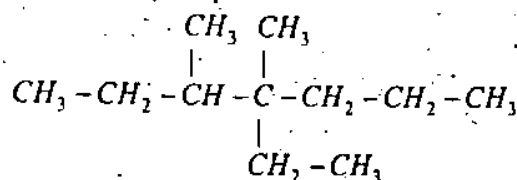
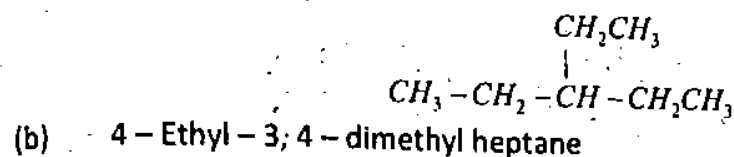
68. Write down structural formulas of following compounds.

(a) 3 – Ethyl pentane (b) 4 – Ethyl – 3, 4 dimethyl Heptane

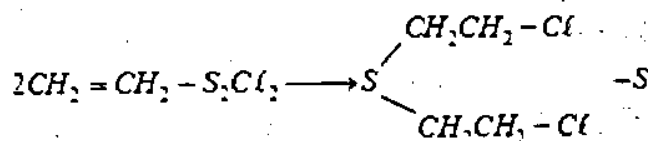
Ans: (a) 3 – Ethyl Pentane

$$CH_3-CH_2-\overset{\overset{CH_2CH_3}{|}}{CH}-CH_2CH_3$$

(b) 4 – Ethyl – 3, 4 – dimethyl heptane

$$CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-\underset{\underset{CH_2-CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2-CH_3$$

69. What is Mustard gas? How is it produced. **(3 Times)**

Ans: Mustard gas is chemical used in world war I. It is not a gas but high boiling liquid, causes blisters.

$$2CH_2=CH_2-S_2Cl_2\longrightarrow S\begin{matrix}\diagup CH_2CH_2-Cl\\ \diagdown CH_2CH_2-Cl\end{matrix} \quad -S$$

70. Write structural formulas of following compounds.

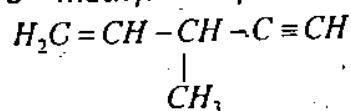
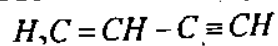
(i) 3 – methyl – 1 – Pentene – 4 – yne

(ii) But – 1 – en – 3 – yne

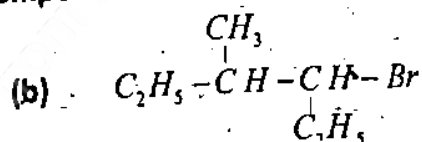
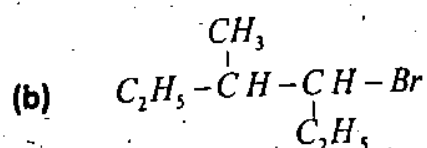
Ans: (i) 3 – methyl – 1 – penten – 4 – yne

$$H_2C=CH-\underset{\underset{CH_3}{|}}{CH}-C\equiv CH$$

(ii) But – 1 – en – 3 – yne

$$H_2C=CH-C\equiv CH$$

2021

71. Write IUPAC names of the following compounds:

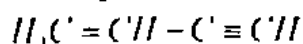
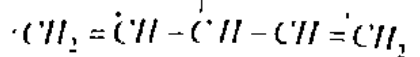
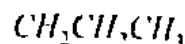
(a) $(CH_3CH_2)_3CBr$ (b) $C_2H_5-\overset{\overset{CH_3}{|}}{C}H-\underset{\underset{C_2H_5}{|}}{C}H-Br$

Ans: (a) $(CH_3CH_2)_3CBr$ (b) $C_2H_5-\overset{\overset{CH_3}{|}}{C}H-\underset{\underset{C_2H_5}{|}}{C}H-Br$

3-Bromo-3-ethylpentane 3-Bromo-4-methylhexane

72. Write the structural formulas for these compounds.

(a) 3-n-propyl-1, 4-pentadiene **(b) But-1-en-3-yne**

Ans: (a) 3-n-propyl-1, 4-pentadiene

$$CH_2=CH-CH(CH_2CH_2CH_3)-CH=CH_2$$

(b) But-1-en-3-yne $H_2C=CH-C\equiv CH$

73. How will you convert? (a) Ethene into ethyl alcool (b) Ethene into ethyne.

Ans: (a). Ethene into ethyl alcool:

When ethane is treated with cold concentrated sulphuric acid, they are dissolved because they react by addition to form alkyl hydrogen sulphate. For example,

$CH_2=CH_2 + H_2SO_4 \rightarrow CH_3-CH_2-O-SO_3H$

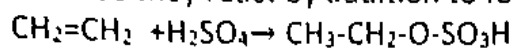
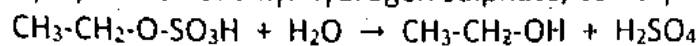
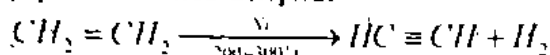
Ethyl hydrogen sulphate

By hydration of alkyl hydrogen sulphate, corresponding alcohol is produced.

$CH_3-CH_2-O-SO_3H + H_2O \rightarrow CH_3-CH_2-OH + H_2SO_4$

Ethy alcohol

(b) Ethene into ethyne:

$$CH_2=CH_2 \xrightarrow[200-300°C]{Ni} HC\equiv CH + H_2$$

74. Why alkanes are called paraffins?

Ans: The alkanes or paraffins (Latin: parum = little, affins = affinity) under ordinary condition are inert towards acids, alkalis, oxidizing and reducing agents. However, under suitable conditions, alkanes do undergo two types of reactions.

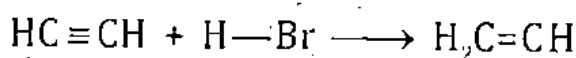
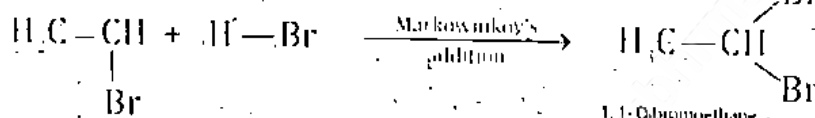
1. Substitution Reactions
2. Thermal and Catalytic Reactions.

75. Give the formation of 1, 1 - Dibromoethane from alkyne.

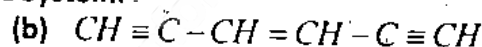
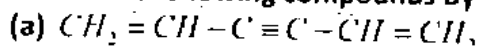
Ans: Alkynes react with hydrogen chloride and hydrogen bromide to form dihaloalkanes. The reaction occurs in accordance with Markownikov's rule.

$$HC\equiv CH + H-Br \longrightarrow H_2C=CH(Br)$$

Ethyne — Vinyl bromide

$$H_2C=CH(Br) + H-Br \xrightarrow[\text{addition}]{\text{Markownikov's}} H_3C-CHBr_2$$

1, 1-Dibromoethane

76. Name the following compounds by IUPAC System:

(a) $CH_2=CH-C\equiv C-CH=CH_2$ (b) $CH\equiv C-CH=CH-C\equiv CH$

Ans: (a) $CH_2=CH-C\equiv C-CH=CH_2$: 1,5-Hexadien-3-yne

(b) $CH\equiv C-CH=CH-C\equiv CH$: 3 – Hexen-1,5-diyne

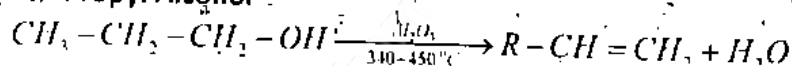
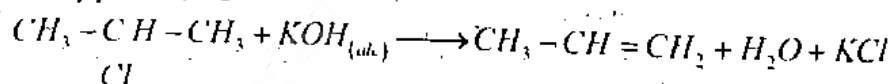
77. Write down Chemical Equations for the preparation of Propene from:

(a) n- Propyl Alcohol (b) iso-Propyl Chloride

Ans: (a) **n- Propyl Alcohol**

$$CH_3-CH_2-CH_2-OH \xrightarrow[340-450°C]{Al_2O_3} R-CH=CH_2 + H_2O$$

(b) **iso-Propyl Chloride**

$$CH_3-CH(Cl)-CH_3 + KOH_{(alc)} \longrightarrow CH_3-CH=CH_2 + H_2O + KCl$$

78. Give two physical properties of Alkanes.

Ans: 1. Alkanes containing upto four carbon atoms are colourless, odourless gases while pentane to heptadecane (C5 to C17) are colourless, odourless liquids. The higher members from C18 onwards are waxy solids which are also colourless and odourless.

2. Alkanes are non-polar or very weakly polar and are insoluble in polar solvents like water, but soluble in non-polar solvents like benzene, ether, carbon tetra chloride,etc.

CHAPTER NO:8 LONG QUESTIONS ALIPHATIC HYDROCARBON IN ALL PUNJAB BOARD PAPERS-2011-2021

Topic No: 8.3.1

1. Write two methods for the preparation of Alkanes from Alkyl halides. (2 times)

Ans: (Text Book Page No:143)

2. Explain with equations how Alkanes can be prepared from (i) Acids

Ans: (Text Book Page No:143)

3. Prepare Ethane From Kolbe's Electrolytic method. Also write down its mechanism. (3 Times)

Ans: (Text Book Page No:144)

Topic No: 8.3.4/4

4. Explain free radical mechanism for the reaction of chlorine with methane in the presence of sunlight. (4 times).

Ans: (Text Book Page No:147)

5. Write a note on halogenations of alkanes.

Ans: (Text Book Page No:148)

Topic No: 8.4.1

6. Discuss any two method of preparation of alkenes. (6 times)

Ans: (Text Book Page No:149)

Topic No: 8.4.4

7 Write balanced equations for the reactions of ethenewith:
(i) O_2/Ag (ii) S_2Cl_2 (iii) $KMnO_4$ (iv) HOCl

Ans: (Text Book Page No:i-155,ii-157.iii-155.iv-155)

8. Write the chemical reaction of ethene with the following.
(i) HCl (ii) Br_2 (iii) O_3 (iv) HOX

Ans: (Text Book Page No:153+156)

9 Write the reactions of ethene with:
(i) Br_2 (ii) O_3 (iii) HBr (iv) HOCl

Ans: (Text Book Page No:i-154.ii-156.iii-153,iv-155)

10 Write the reaction of propene with:
(i) H_2/Ni (ii) Cone.H_2SO_4 (iii) HCl (iv) HOCl

Ans: (Text Book Page No:i-152,ii-154.iii-153.iv-155)

11 Write the reactions of ethene with: (i) $HOC\ell$ (ii) dilute $KmnO_4$ (iii) Ozone (iv) $S_2C\ell_2$

Ans: (Text Book Page No:154)

12 What happened when ethene is reacted with $KMnO_4$, HBr and S_2Cl_2.

Ans: (Text Book Page No:155+153+157)

13 What is Markownikov'sRule? Give two examples. (3 times)

Ans: (Text Book Page No:153)

14. How will you convert ethane into:
(i) Ethyl alcohol (ii) Ethylene epoxide (iii) Ethylene glycol (iv)Ethylene chlorohydrins.

Ans: (Text Book Page No:154+155)

15 How will you make the following conversion.
(i) Ethene into ethanol (ii) Ethanol into 2-Butanone

Ans: (Text Book Page No:154)

16 How will you make the following conversions from an alkene;
(i) 2-Bromopropane. (ii) 2- Bromo-2methylpropane
(iii) 2-propanol (iv) propylene oxide
Ans: (Text Book Page No:154)
17 Give the chemical reactions of ethenewith:
(i)O_2 in the presence of Ag_2O (ii) Conc. H_2SO_4 (iii) S_2Cl_2 (iv) HOCl
Ans: (Text Book Page No:152)

Topic No: 8.5

18 Starting from ethene, outline the reactions for preparation of the following compounds.
(i) 1,2dibromoethane ii) Ethyne (iii) Ethane (iv) Ethylene glycol
Ans: (Text Book Page No:i-154, ii-157,iii-143,iv-155)

Topic No: 8.5.1

19 How Kolb's electrolysis method is used for preparation of alkenes & alkynes.
Ans: (Text Book Page No:150)
20 Give the preparation of ethyne by: (2 times)
Dehydrohalogenation of vicinal dihalide (ii) Kolbe's electrolytic method
Ans: (Text Book Page No:157+158)
21 Describe mechanism for the electrolysis of potassium maleate to prepare ethyne.
Ans: (Text Book Page No:158)

Topic No: 8.5.4

22 Discuss acidic nature of alkynes with at least two examples. (7 times)
Ans: (Text Book Page No:162)
23 Show the reactions that ethene and ethyne are unsaturated. How can they be distinguished? Complete also the corresponding chemical reaction. (2 times)
Ans: (Text Book Page No:152+159)
24 Write a note on polymerization of ethyne. (4 times)
Ans: (Text Book Page No:161)
25 Describe how you could distinguished ethane, ethene and ethyne from one another by means of chemical reactions.
Ans: (Text Book Page No:146+152+159)
26 How does ethyne react with:
(i) Hydrogen (ii) Halogen acid (iii) Alkaline $KMnO_4$
Ans: (Text Book Page No:i-159.ii-160.iii-161)
27. Write chemical equations of reactions of ethynewith.
(i) Cl_2 (ii) HCN (iii) NH_3 (iv) $H_2O \xrightarrow[H_2SO_4]{HgSO_4}$
Ans: (Text Book Page No:160+161+162)
28. How will you Synthesize the following compounds starting from ethyne.
(i) Chloroprene (ii) Glyoxal (iii) Methyl nitrile (iv) Acetaldehyde.
Ans: (Text Book Page No:160+161+162)
29. How will you distinguish ethane, ethene and ethyne.
Ans: (Text Book Page No:143+150+157)
30. How acetylene can be converted into
(i) Acetaldehyde (ii) Chloroprene (iii) Acrylonitrile (iv) Divinyl acetylene
Ans: (Text Book Page No:159)

31. How will you convert ethyne to (I). Ethane (II) Acetaldehyde (III) Divinyl acetylene (IV) Glyoxal (2 Times)

Ans: (Text Book Page No:143)

32. Make the following changes. (I). Aeration (II) Ethyne into Benzene.

Ans: (Text Book Page No:162)

33. How will you bring about the following conversions?
I) 1- butane into 1 – butyne II) acetylene into chloroprene

Ans: (Text Book Page No:)

34. Synthesize: i)Oxalic acid ii) Methyl nitrile
iii) Acetaldehyde iv) Acrylonitrile starting from ethyne.

Ans: (Text Book Page No:231)

Topic No: 8.5.6

35. Give comparison of reactivates of alkane, alkene and alkyne.

Ans: (Text Book Page No:145+151+159)

2018

36. How will you prepare following from ethyne (Equations only)
(i) Acetaldehyde (ii) Benzene (iii) Ethane (iv) Oxalic acid

Ans: (Text Book Page No:157)

37. How will you bring about the following conversions.
(i) Methane to Ethane (ii) Acetic acid to Ethane

Ans: (Text Book Page No:)

38. Discus the following terms with respect to alkenes with suitable chemical reactions.
(i) Ozonolysis (ii) Hydroxylation

Ans: (Text Book Page No:155+156)

39. Write down the structural formulae for the products formed when 1-butene reacts with
(i) Cold dil. $KMnO_4$ /OH- (ii)HBr (iii) O_2 in the presence of Ag_2O (iv) HOCl

Ans: (Text Book Page No:155)

40. Prepare alkenes from (i) carbonyl compounds (aldehyde and ketones) (ii) Grignard reagent (iii) Alkyl halide

Ans: (Text Book Page No:149)

41. How is ethyne react with:
(i) Alkaline $KMnO_4$ (ii) 10% H_2SO_4(iii) HBr (iv) NH_3

42. Describe preparation of ethane (CH_3-CH_3) by each of the following methods:
(i) By carboxylation of monocarboxylic acid (ii) by Kolbe electrolysis method

2021

43. Name the following compounds according to IUPAC system:
(i) $(CH_3)_2C=CH_2$ (ii) $(CH_3CH_2)_3CH$ (iii) $HC=C-CH=CH-CH_3$

(iv) $HC=C-\underset{\displaystyle CH_3}{\underset{|}{C}}H=CH=CH_2$

44. Write down four methods for the preparation of alkenes.

45. How will you prepare Acetylene from: (i) Vicinal Dihalide (ii) Tetrahalide

46. Give Polymerization Reactions of Ethyne to Prepare :
(i) Divinyl Acetylene (ii) Synthetic Rubber (iii) Benzene

47. Give the preparation reactions of alkanes from
(i) Carbonyl compounds (ii) Alkyl Halidess

CHAPTER NO:9 OBJECTIVES (MCQ'S) AROMATIC HYDROCARBON IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 9.1

1. Aromatic hydrocarbons are the derivatives of: (2 times)
(a) Normal series of paraffins (b) Alkene (c) Benzene (d) Cyclohexane

Topic No: 9.3

2. Total number of π electrons in benzene are:
(a) 3 (b) 6 (c) 12 (d) 18

Topic No: 9.3.7

3. How many resonance structures of benzene are known:
(a) 3 (b) 4 (c) 5 (d) 6

4. C – C bond length in benzene is: (2 times)
(a) 1.34 A° (b) 1.20 A° (c) 1.39 A° (d) 1.54 A°

5. The Benzene Molecule contains:- (3 times)
(a) Three double bonds (b) Two double bonds
(c) One double bond (d) Delocalized - π electron charge

Topic No: 9.4

6. The conversation of n-hexane to benzene by heating in presence of Pt is called: (4 times)
(a) Isomerization (b) Dealkylation (c) Rearrangement (d) Aromatization.

Topic No: 9.5

7. Benzene cannot undergo reactions: (8 times)
(a) Substitution (b) Addition (c) Oxidation (d) Elimination

Topic No: 9.5.2

8. Toluene $\xrightarrow[100\ ^\circ C]{3HNO_3 + H_2SO_4}$
(a) O-nitrotoluene (b) M- nitrotoluene (c) P- nitrotolueue (d) 2,4,6,-TNT

9. During nitration of benzene the active nitrating agent is: (10 times)
(a) NO_3^- (b) NO_2 (c) NO_2^- (d) NO_2^+

10. Which of the following acid can be used as a catalyst in Friedel crafts reaction? (12 times)
(a) $AlCl_3$ (b) HNO_3 (c) $BeCl_2$ (d) NaCl

11. The electrophile used for sulphonation of benzene is: (10 times)
(a) SO_3 (b) SO_4 (c) HSO_4^+ (d) H_2SO_4

Topic No: 9.5.4

12. Ortho, Para derivatives are obtained by halogenations of:
(a) Nitrobenzene (b) Toluene (c) Benzaldehyde (d) Benzene

13. Among the following, the compound that can be sulphonated most easily is: (4 times)
(a) Toluene (b) Benzene (c) Nitrobenzene (d) Chlorobenzene

14. m –Chloronitro benzene is prepared by:
(a) Nitration of Chloro benzene (b) Nitration of Benzene
(c) Nitration of m-Chloro benzene (d) Chlorination of nitro benzene

Topic No: 9.6

15. In the given compounds the most reactive one is: (4 times)
(a) Benzene (b) Ethene (c) Ethane (d) Ethyne

2019

16. Sooty flame on burning aromatic-compound is dud to:
(a) High percentage of hydrogen (b) Ring structure
(c) High percentage of carbon (d) Resistant reaction with air

17. Molecular formula of benzyl chloride is:
(a) $H_5C_6CCl_3$ (b) $H_5C_6HCl_2$ (c) $H_5C_6CH_2Cl$ (d) $H_5C_6CH_2.CH_2Cl$

2021

18. **Which is meta-directing group?** **(2 Times)**
(a) –OH (b) $-NH_2$ (c) $-NO_2$ (d) $-Cl$

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

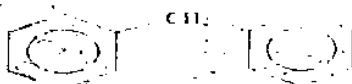
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	B	C	C	D	D	D	D	D	A	A	B	A	D	B
16	17	18												
C	C	C												

CHAPTER NO:9 SHORT QUESTIONS AROMATIC HYDROCARBON IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 9.1

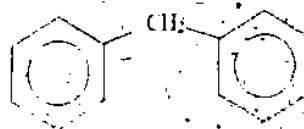
1. **Write structural formulas of: (a) naphthalene. (b) Diphenylmethane.**

Ans: (a): Naphthalene

(b):Diphenylmethane

2. **Write the structures of following compounds:**

(a) Biphenyl **(b) Diphenylmethane**

Ans:

Biphenyl

Diphenylmethane

3. **What are aromatic hydrocarbons? Give two examples.**

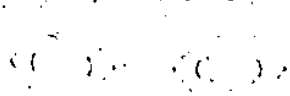
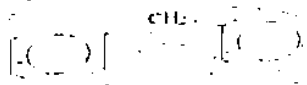
Ans: The carbocyclic compounds containing at least one benzene ring, six carbon atoms with three alternate double and single bonds are called aromatic hydrocarbons. These bonds are usually shown in the form of a circle.

Examples: Toluene, Phenol, Benzaldehyde and Nitrobenzene.

4. **What are monocyclic and polycyclic aromatic Hydrocarbons?** **(4 times)**

Ans: <u>Monocyclic:</u> Aromatic hydrocarbons containing one benzene ring in their molecules are called monocyclic aromatic hydrocarbons e.g. benzene, toluene, phenol, aniline benzoic acid, benzaldehyde and benzene sulphonic acid.

<u>Polycyclic:</u> Aromatic hydrocarbons containing two or more benzene rings in their molecules are called monocyclic aromatic hydrocarbons. These are further divided into two main classes;

(I). Those in which benzene rings are isolated. For example biphenyl, diphenylmethan etc.

Biphenyl Diphenylmethane

(II). Those in which the benzene rings are fused together at ortho position so that the adjacent rings have a common carbon to carbon bonds. For example, naphthalene, phenanthrene and anthracene.

Examples:

Naphthalene, Anthracene Phenanthrene

5. Write down formulas for (I).. Aniline (II) Toluene

Ans: **Formulas of(I).. Aniline (ii). Toluene**

(I)..Aniline($C_6H_5NH_2$): (II)Toluene($C_6H_5CH_3$):

6. What is meant by the terms: (I).. Aromatic (II).. Oxidation

Ans: (I).. **Aromatic:** The term aromatic was derived from the Greek word 'aroma' meaning "fragrant" and was used in organic chemistry for s special class of compounds. These compounds have low hydrogen to carbon ratio in their molecular formula and have a characteristic odour. These often produced by benzene or derivatives of benzene.

(ii).. **Oxidation:** The addition of oxygen, removal of hydrogen or electrons is called oxidation. Oxidation process is carried out by some oxidizing agent like $KMnO_4$,$K_2Cr_2O_7$ or V_2O_5etc. which can provide oxygen to a compound.

7. Write down the formula of aniline and benzaldehyde.

Ans: **<u>Formulae of aniline and benzaldehyde:</u>**

Formula of aniline :($C_6H_5NH_2$)

Formula of benzaldehyde :(C_6H_5CHO)

8. Name the formulas of any two aromatic acids along with names.

Ans: **<u>Formulas aromatic acids:</u>**

Benzoic acid Benzene sulphonic acid

9. Write down structural formulas of (a) oxalic acid (b) benzoic acid (2 times)

Ans: **<u>Structural formulae of oxalic acid and benzoic acid:</u>**

Structural formula of benzoic acid:

Structural formula of oxalic acid :

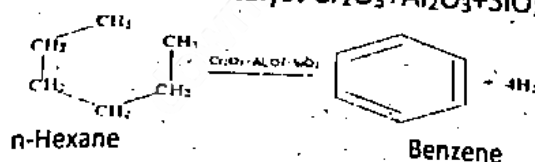
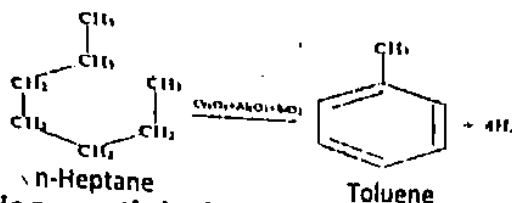
$$HO-\overset{O}{\overset{\|}{C}}-\overset{O}{\overset{\|}{C}}-OH$$

Topic No: 9.1/3

10. How Haxane and Heptane can give Benzene and Toluene respectively? (3 Times)

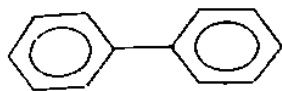
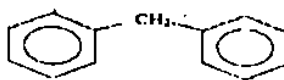
Ans: Benzene and toluene are prepared by passing the vapours of n-hexane or n-heptane over the mixture of catalyst $Cr_2O_3+Al_2O_3+SiO_2$ at 500ºC.

n-Hexane Benzene

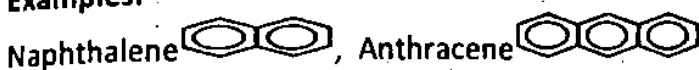
n-Heptane Toluene

11. What are polycyclic aromatic hydrocarbons? Give example.

Ans: Aromatic hydrocarbons containing two or more benzene rings in their molecules are called monocyclic aromatic hydrocarbons. These are further divided into two main classes;

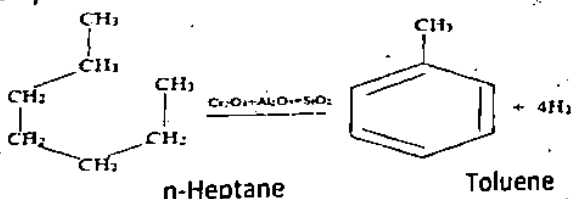
(i).. Those in which benzene rings are isolated. For example biphenyl, diphenylmethan etc.

Biphenyl Diphenylmethane

(ii).. Those in which the benzene rings are fused together at ortho position so that the adjacent rings have a common carbon to carbon bonds. For example, naphthalene, phenanthrene and anthracene.

Examples:

Naphthalene, Anthracene

and Phenanthrene

12. Convert heptane into toluene?

Ans: Toluene is prepared by passing the vapours of n-heptane over the mixture of catalyst $Cr_2O_3+Al_2O_3+SiO_2$ at 500ºC.

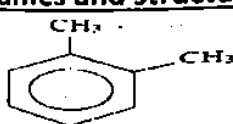
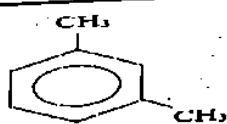
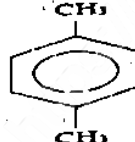
n-Heptane Toluene

13. Write structures of the followings: (i) Naphthalene (ii)Anthracene. / Write names and formulas of two fused ring hydrocarbons. (2 times)

Ans: **Structures of Naphthalene and Anthracene:**

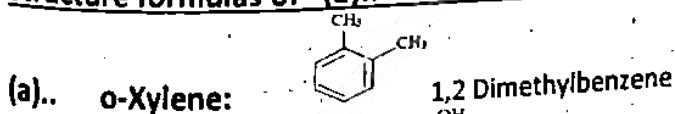
Naphthalene Anthracene

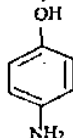
Topic No: 9.2/3

14. Write names and draw structures of three possible isomers of Xylene?(4 times)

Ans: **Names and structures of three possible isomers of Xylene:-**

1,2Dimethylbenzene (o-Xylene) 1,3 Dimethylbenzene (m-Xylene) 1,4 Dimethylbenzene (p-Xylene)

15. Write down structure formulas of

(a).. o-Xylene (b).. 4-amino phenol

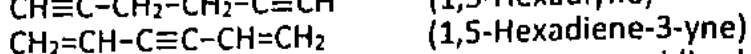
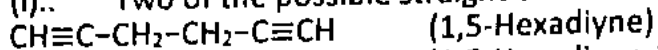
Ans: **Structure formulas of (a).. o-Xylene (b)..4-amino phenol**

(a).. o-Xylene: 1,2 Dimethylbenzene

(b).. 4-amino phenol:

Topic No: 9.3.2

16. Give two reasons to rule out straight chain structure of benzene? (2 times)

Ans: (i).. Two of the possible straight chain formulas suggested for benzene are:

$CH\equiv C-CH_2-CH_2-C\equiv CH$ (1,5-Hexadiyne)

$CH_2=CH-C\equiv C-CH=CH_2$ (1,5-Hexadiene-3-yne)

A compound having above structures are oxidized by alkaline $KMnO_4$ solution. But benzene is stable to $KMnO_4$ solution.

(ii).. Assuming straight chain structure of benzene, each carbon carries one H-atom, it should be capable of forming three mono substitution products. But benzene yields only one mono substituent product.

(iii).. Alkanes have molecular formula C_nH_{2n+2}, alkene has C_nH_{2n} and alkyne has C_nH_{2n-2}. But benzene has molecular formula C_6H_6 does not belong to open chain hydrocarbon and therefore possibility of a straight chain structure is ruled out.

17. How will you prove that, benzene has cyclic structure? (2 Times)

Ans The X-Ray studies of benzene have confirmed the hexagonal structure of it. These studies have also revealed that all the carbon and hydrogen atoms are in the same plane. All the angles are of 120°. All C-C and C-H bonds lengths are 1.397 A° and 1.09A° respectively.

Topic No: 9.3.4

18. What informations are obtained about structure of benzene from X-ray studies. (5 times)

Ans: The X-Ray studies of benzene have confirmed the hexagonal structure of it. These studies have also revealed that all the carbon and hydrogen atoms are in the same plane. All the angles are of 120°. All C-C and C-H bonds lengths are 1.397 A° and 1.09A° respectively.

Topic No: 9.3.7

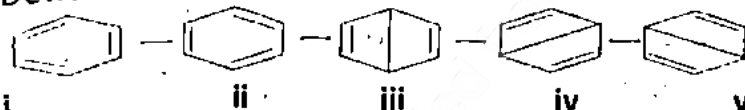
19. Define resonance energy? What is the resonance energy of Benzene?(6 times)

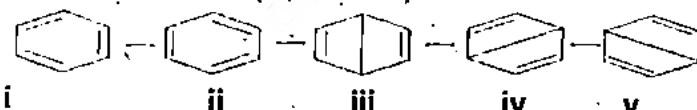
Ans: Benzene is more stable than the hypothetical 1,3,5-cyclohexatriene by 150.5 kJ/mole. This difference between amount of heat is actually released and that calculated on the basis of the Kekule structure is called 'Resonance Energy'. Benzene shows the phenomenon of resonance which makes it more stable than others. In benzene electrons are delocalized making it a very stable molecule. The resonance energy of benzene is 150.5 kJ/mole.

20. What objections were raised on Kekule's formula of Benzene? (2 times)

Ans: Kekule's formula with three double bonds demands a high degree of unsaturation from benzene while usually it exhibits a saturated character. This benzene yields substitution products readily and forms addition products reluctantly. Benzene is also a very stable compound, all these properties of benzene can easily explained use in their modern theories about it structure.

21. What is resonance? Draw two resonance structures of benzene. (2 times)

Ans: The possibility of different pairing schemes of valence electrons of atoms is called resonance, and the different structures thus arranged are called "Resonance structures". Benzene has two Kekule structures (i and ii) and three Dewar structures (iii,iv and v).

22. Write down the resonance structures of benzene? (3 Times)

Ans: The possibility of different pairing schemes of valence electrons of atoms is called resonance, and the different structures thus arranged are called "Resonance structures". Benzene has two Kekule structures (i and ii) and three Dewar structures (iii,iv and v).

23. Define resonance and resonance Energy. **(3 Times)**

Ans: Benzene is more stable than the hypothetical 1,3,5-cyclohexatriene by 150.5 kJ/mole. This difference between amount of heat is actually released and that calculated on the basis of the Kekule structure is called 'Resonance Energy'. Benzene shows the phenomenon of resonance which makes it more stable than others. In benzene electrons are delocalized making it a very stable molecule. The resonance energy of benzene is 150.5 kJ/mole.

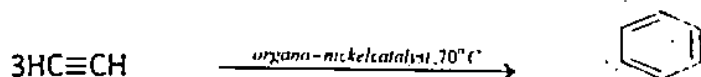
Topic No: 9.4

24. Why benzene is less reactive than alkenes although it has three pi (π) bonds in it? **(3 times)**

Ans: Benzene is extraordinary stable molecule. This stability is due to the extensive delocalization of π-electron cloud. The unhybridized $2p_z$ orbital partially overlap to form a continuous sheath of electron cloud, enveloping, above and below, the six carbon-carbon sigma bonds of the ring. Since each $2p_z$ orbital is overlapped by the $2p_z$ orbitals of adjacent carbon atoms, therefore, this overlapping gives, diffused or delocalized electron cloud. The stability of benzene can be measured by comparing it with hypothetical compound, 1,3,5cyclohexatriene.

25. Benzene can be prepared commercially from acetylene. Give reaction with conditions? **(6 times)**

Ans: Benzene is formed by passing acetylene under pressure over an organo-nickel catalyst at 70ºC.

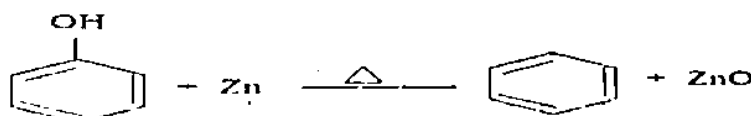
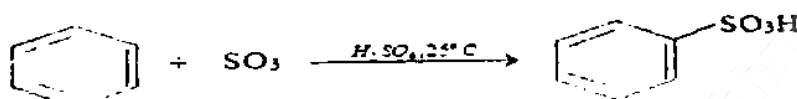
$$3HC\equiv CH \xrightarrow{\text{organo-nickel catalyst, }70^\circ C} C_6H_6$$

26. Give reaction of : (a) Phenol with zinc, (b) Benzene with SO_3.

Ans: Reaction of (a) Phenol with zinc (b) Benzene with SO_3

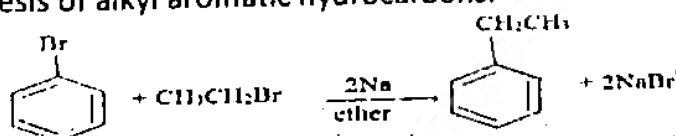
(a) Phenol with zinc:

$$C_6H_5OH + Zn \xrightarrow{\Delta} C_6H_6 + ZnO$$

(b) Benzene with SO_3:

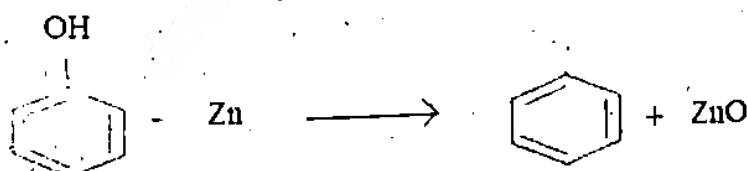
$$C_6H_6 + SO_3 \xrightarrow{H_2SO_4,\ 25^\circ C} C_6H_5SO_3H$$

27. What is Wurtz-Fritting reaction? / What is wurtz-fitting reaction? How it helps to prepare ethyl benzene? **(6 times)**

Ans: The Wurtz reaction for the synthesis of alkanes was extended by Fitting in 1864 to the synthesis of alkyl aromatic hydrocarbons.

$$C_6H_5Br + CH_3CH_2Br \xrightarrow[\text{ether}]{2Na} C_6H_5CH_2CH_3 + 2NaBr$$

28. How benzene can be prepared from sodium benzoate and phenol?

Ans **Preparation of benzene from sodium benzoate:**

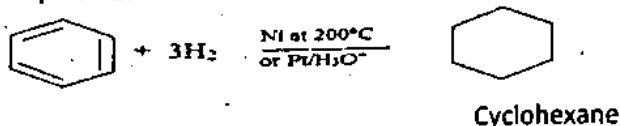
$$C_6H_5COONa + NaOH \longrightarrow C_6H_6 + Na_2CO_3$$

Preparation of benzene from phenol:

Topic No: 9.5.1

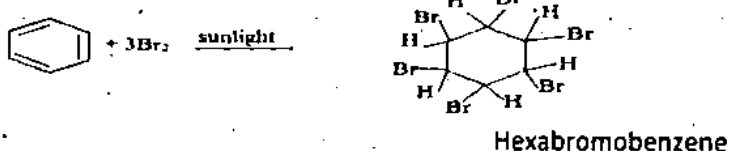
29. Give two reactions which show that Benzene is an unsaturated hydrocarbon? (5 times)

Ans: (i).. **Reduction:** Benzene is reduced to cyclohexane on heating at high temperature with hydrogen in the presence of Pt in an acidic solvent(acetic acid) or Ni at 200ºC as a catalyst. This reaction shows that benzene is un-saturated compound.

$$C_6H_6 + 3H_2 \xrightarrow[\text{or } Pt/H_3O^+]{Ni \text{ at } 200^\circ C} C_6H_{12}$$

Cyclohexane

(ii).. **Halogenation:** Benzene reacts with chlorine and bromine in the presence of sunlight to give addition products, hexachlorobenzene or hexabromobenzene.

$$C_6H_6 + 3Br_2 \xrightarrow{\text{sunlight}} C_6H_6Br_6$$

Hexabromobenzene

30. What are the major products when chlorine reacts with Toluene in the presence of sunlight?

Ans: When alkyl benzene are treated with chlorine or bromine in the presence of sunlight, only the alkyl groups are substituted.

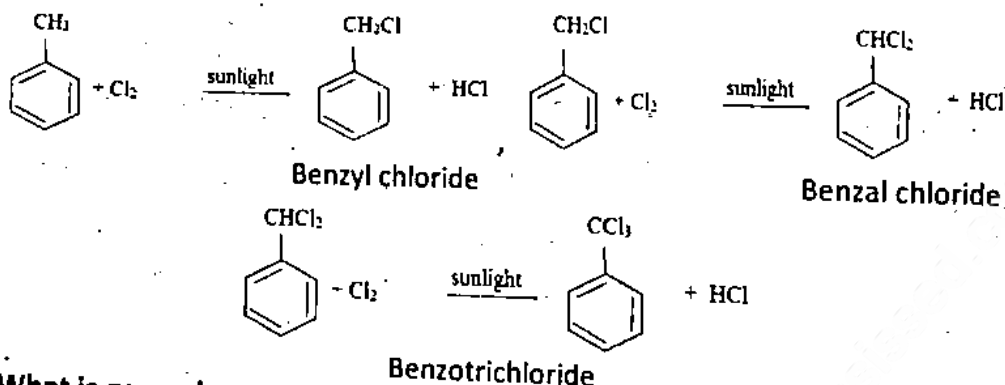
$$C_6H_5CH_3 + Cl_2 \xrightarrow{\text{sunlight}} C_6H_5CH_2Cl + HCl$$

Benzyl chloride

$$C_6H_5CH_2Cl + Cl_2 \xrightarrow{\text{sunlight}} C_6H_5CHCl_2 + HCl$$

Benzal chloride

$$C_6H_5CHCl_2 + Cl_2 \xrightarrow{\text{sunlight}} C_6H_5CCl_3 + HCl$$

Benzotrichloride

31. What is general pattern of reactivity of benzene towards electrophone?

Ans The highly sable, delocalized electrons of benzene ring not readily available for the nucleophilic attack like the electrons of alkenes. Therefore, the electrons of benzne ring do not assist in the attack of weak electrophiles.
It means that more powerful electrophiles are required to penetrate and break the continuous sheath of electron cloud in benzene, e.g. substitution of halogen in benzene require iron or corresponding ferric halide as a catalyst.

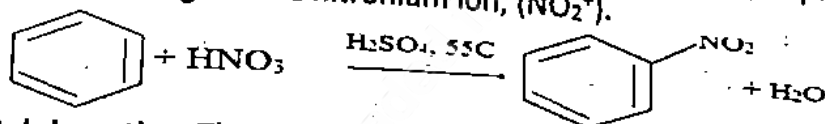
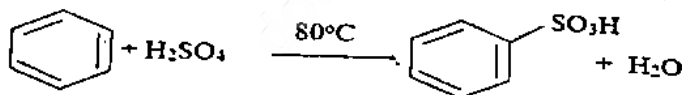
Topic No: 9.5.2/2

32. Write down nitration and sulphonation of Benzene?

Ans: <u>**Nitration:**</u> The introduction of NO_2 group in benzene ring is called "Nitration". The nitration of benzene takes place when it is heated with a 1:1 mixture of conc. HNO_3 and conc. H_2SO_4 at 50-55ºC. Sulphuric acid reacts with nitric acid to generate nitronium ion, (NO_2^+).

$$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4,\ 55C} C_6H_5NO_2 + H_2O$$

<u>**Sulphonation:**</u> The introduction of sulphonic acid group in benzene ring is called "Sulphonation". When benzene is heated with fuming H_2SO_4 or conc. H_2SO_4. It yields benzene sulphonic acid.

$$C_6H_6 + H_2SO_4 \xrightarrow{80^\circ C} C_6H_5SO_3H + H_2O$$

Or

Benzenesulphonic acid

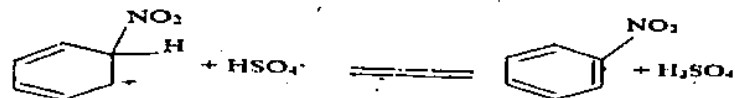
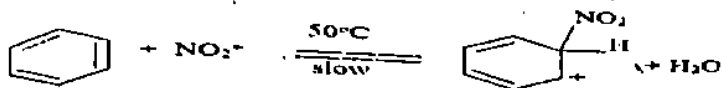
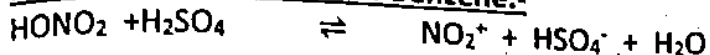
$C_6H_6 + SO_3 \xrightarrow[25°C]{H_2SO_4} C_6H_5SO_3H$

33. **Give the mechanism of nitration of Benzene?** **(10 times)**

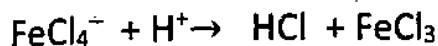
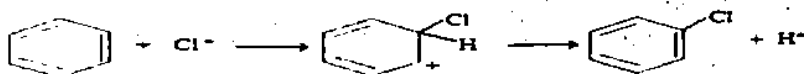
Ans: **Mechanism of nitration of Benzene:-**

$HONO_2 + H_2SO_4 \rightleftharpoons NO_2^+ + HSO_4^- + H_2O$

$C_6H_6 + NO_2^+ \xrightarrow[slow]{50°C} C_6H_6NO_2^+ + H_2O$

$C_6H_6NO_2^+ + HSO_4^- \rightleftharpoons C_6H_5NO_2 + H_2SO_4$

Nitrobenzene

34. **Write down mechanism for halogenation of benzene?** **(2 times)**

Ans: **Mechanism for halogenation of benzene:**

$X_2 + FeX_3 \rightarrow X^+ + FeX_4^-$

$Cl_2 + FeCl_3 \rightarrow Cl^+ + FeCl_4^-$

$C_6H_6 + Cl^+ \longrightarrow C_6H_6Cl^+ \longrightarrow C_6H_5Cl + H^+$

$FeCl_4^- + H^+ \rightarrow HCl + FeCl_3$

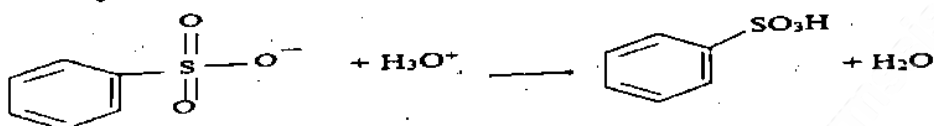
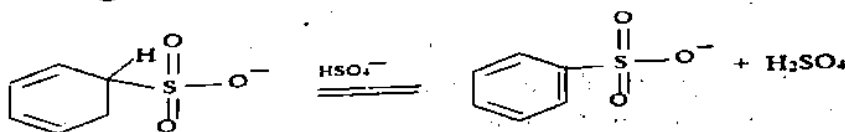
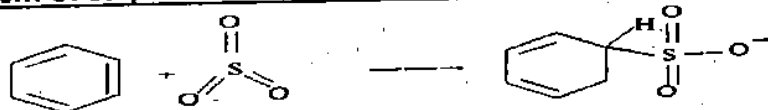
Topic No: 9.5.2/3

35. **Give mechanism of sulphonation of benzene?** **(3 times)**

Ans: **Mechanism of sulphonation of benzene:-**

$C_6H_6 + SO_3 \longrightarrow C_6H_6^+-SO_3^-$ (H, S(=O)(=O)–O⁻ on the same carbon)

$C_6H_6^+-SO_3^- \xrightarrow{HSO_4^-} C_6H_5-SO_3^- + H_2SO_4$

$C_6H_5-SO_3^- + H_3O^+ \longrightarrow C_6H_5SO_3H + H_2O$

36. **Convert benzene into (i) Toluene (ii) Acetophenone** **(3 times)** **(3 times)**

Ans: (i).. **Toluene :** Benzene is converted into toluene by Friedal Craft Alkylation process as:

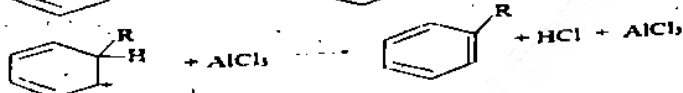
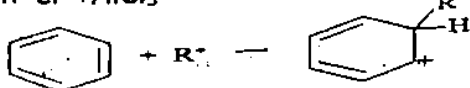
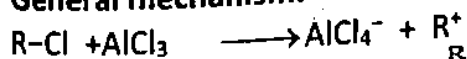
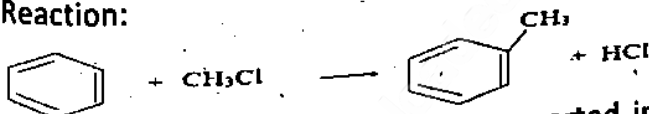
General mechanism:

$R-Cl + AlCl_3 \longrightarrow AlCl_4^- + R^+$

$C_6H_6 + R^+ \longrightarrow C_6H_6R^+$

$C_6H_6R^+ + AlCl_4^- \longrightarrow C_6H_5R + HCl + AlCl_3$

Reaction:

$C_6H_6 + CH_3Cl \longrightarrow C_6H_5CH_3 + HCl$

(ii)Acetophenone: Benzene is converted into acetophenone by Friedal Craft acylation process as:

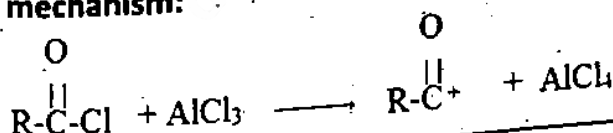
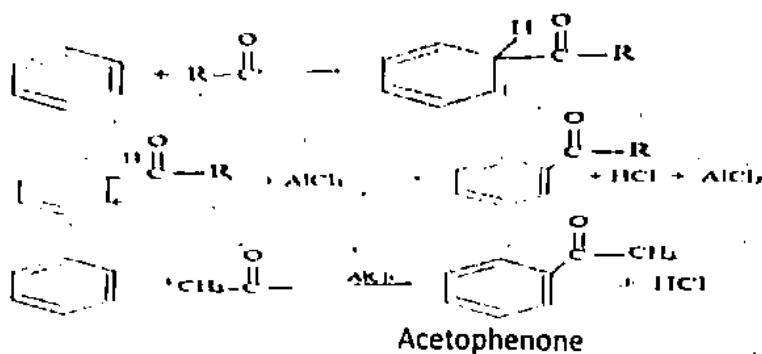
General mechanism:

$R-\overset{O}{\overset{||}{C}}-Cl + AlCl_3 \longrightarrow R-\overset{O}{\overset{||}{C^+}} + AlCl_4^-$

$$C_6H_6 + R-\overset{O}{\overset{||}{C}}^+ \longrightarrow C_6H_6(H)(COR)^+$$

$$C_6H_6(H)(COR)^+ + AlCl_4^- \longrightarrow C_6H_5COR + HCl + AlCl_3$$

$$C_6H_6 + CH_3-\overset{O}{\overset{||}{C}}-Cl \xrightarrow{AlCl_3} C_6H_5COCH_3 + HCl$$

Acetophenone

Topic No: 9.5.2/4

37. What does happen to benzene during Friedel Craft reaction.Give mechanism of one reaction? (2 times)

Ans: Friedel Craft reaction:-

In Fridel Craft reactions, alkylation and acylation of benzene is carried out.

Mechanism of Alkylation:

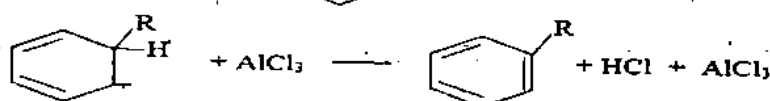
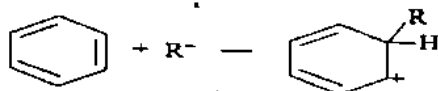
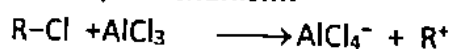
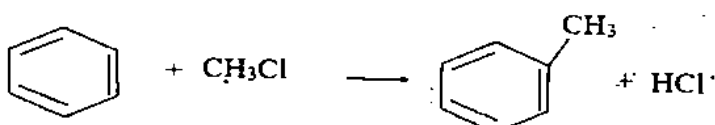
General mechanism:

$$R-Cl + AlCl_3 \longrightarrow AlCl_4^- + R^+$$

$$C_6H_6 + R^+ \longrightarrow C_6H_6(H)(R)^+$$

$$C_6H_6(H)(R)^+ + AlCl_4^- \longrightarrow C_6H_5R + HCl + AlCl_3$$

Example:

$$C_6H_6 + CH_3Cl \longrightarrow C_6H_5CH_3 + HCl$$

38. Write the mechanism of alkylation of benzene? (3 times)

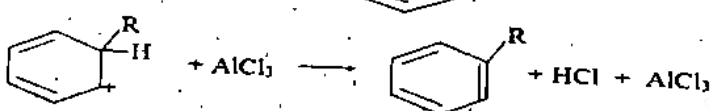
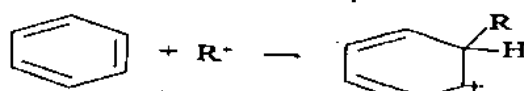
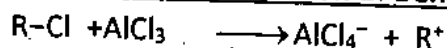
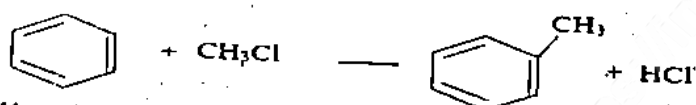
Ans: Mechanism of alkylation of benzene:-

$$R-Cl + AlCl_3 \longrightarrow AlCl_4^- + R^+$$

$$C_6H_6 + R^+ \longrightarrow C_6H_6(H)(R)^+$$

$$C_6H_6(H)(R)^+ + AlCl_4^- \longrightarrow C_6H_5R + HCl + AlCl_3$$

Example:

$$C_6H_6 + CH_3Cl \longrightarrow C_6H_5CH_3 + HCl$$

39. How Benzene can be converted to Acetophenone, give its mechanism?(4 times)

Ans: Benzene is converted into acetophenone by Friedal Craft acylation process as:

General mechanism:

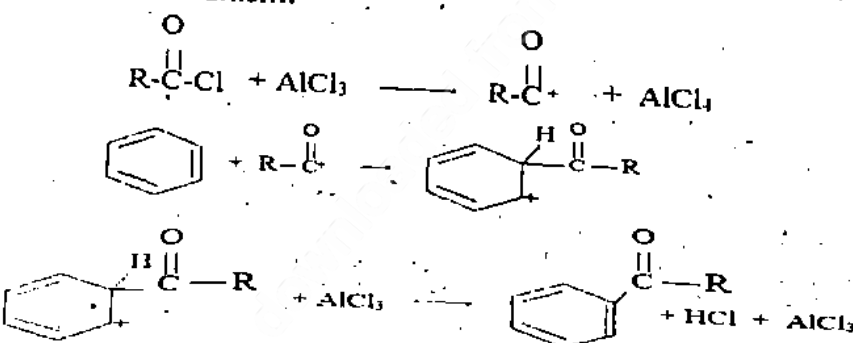
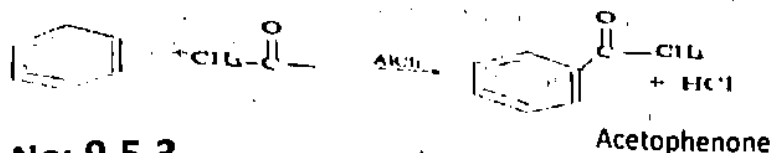
$$R-\overset{O}{\overset{||}{C}}-Cl + AlCl_3 \longrightarrow R-\overset{O}{\overset{||}{C}}^+ + AlCl_4^-$$

$$C_6H_6 + R-\overset{O}{\overset{||}{C}}^+ \longrightarrow C_6H_6(H)(COR)^+$$

$$C_6H_6(H)(COR)^+ + AlCl_4^- \longrightarrow C_6H_5COR + HCl + AlCl_3$$

Reaction:

$C_6H_6 + CH_3-\overset{O}{\overset{||}{C}}-Cl \xrightarrow{AlCl_3} C_6H_5-\overset{O}{\overset{||}{C}}-CH_3 + HCl$

Acetophenone

Topic No: 9.5.3

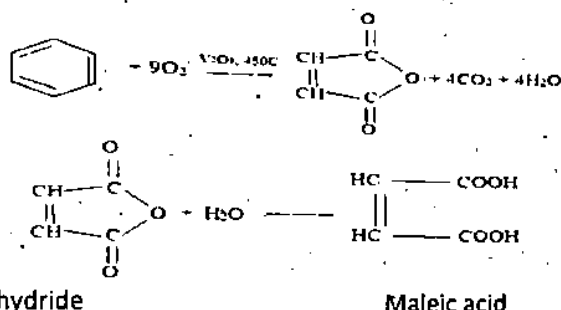
40. Convert Benzene to maleic acid?

Ans: **Conversion of Benzene to maleic acid:-**

The benzene ring is destroyed when it is strongly heated with air in the presence of V_2O_5 as a catalyst.

$$C_6H_6 + 9O_2 \xrightarrow{V_2O_5,\ 450C} (CH-CO)_2O + 4CO_2 + 4H_2O$$

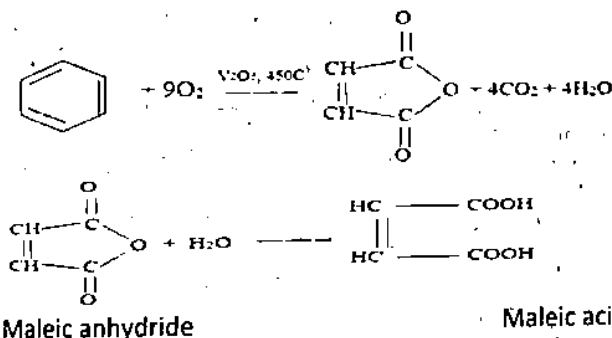
$$(CH-CO)_2O + H_2O \longrightarrow HC(COOH)=HC(COOH)$$

Maleic anhydride — Maleic acid

41. Write the reaction when mixture of benzene vapours and oxygen is passed over heated vanadium pentoxide? (6 times)

Ans: The benzene ring is destroyed when it is strongly heated with air in the presence of V_2O_5 as a catalyst and maleic acid is obtained.

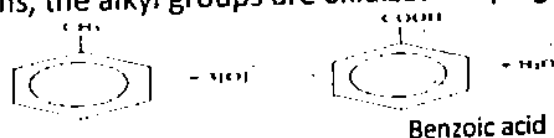
$$C_6H_6 + 9O_2 \xrightarrow{V_2O_5,\ 450C} (CH-CO)_2O + 4CO_2 + 4H_2O$$

$$(CH-CO)_2O + H_2O \longrightarrow HC(COOH)=HC(COOH)$$

Maleic anhydride — Maleic acid

42. How toluene can be converted to benzoic acid? (3 times)

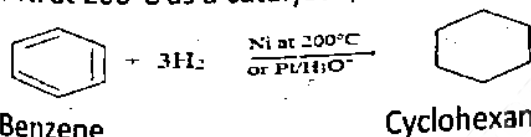
Ans: Alkyl benzene are readily oxidized by acidified $KMnO_4$ or $K_2Cr_2O_7$. In these reactions, the alkyl groups are oxidized keeping the benzene ring intact.

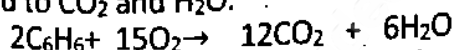
$$C_6H_5CH_3 + 3[O] \longrightarrow C_6H_5COOH + H_2O$$

Benzoic acid

43. Write two addition reactions of benzene.

Ans: (1). Reduction: Benzene is reduced to cyclohexane on heating at high temperature which hydrogen in the presence of Pt in an acidic solvent (acetic acid) or Ni at 200°C as a catalyst.

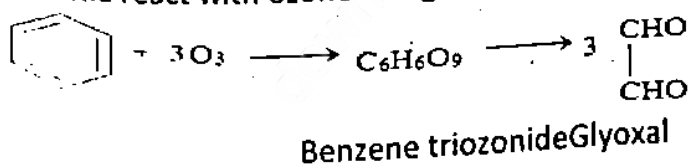
$$C_6H_6 + 3H_2 \xrightarrow[\text{or Pt/H}^+]{\text{Ni at }200^\circ C} C_6H_{12}$$

Benzene — Cyclohexane

(2). Combustion: When benzene is burnt in free supply of air, it is completely oxidized to CO_2 and H_2O.

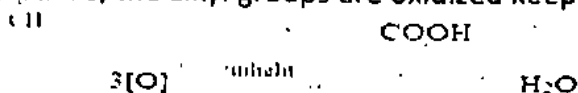
$$2C_6H_6 + 15O_2 \rightarrow 12CO_2 + 6H_2O$$

44. What happen when ozone is reacted with benzene? (3 times)

Ans: Benzene react with ozone and gives glyoxal through benzene triozonide.

$$C_6H_6 + 3O_3 \longrightarrow C_6H_6O_9 \longrightarrow 3\ CHO-CHO$$

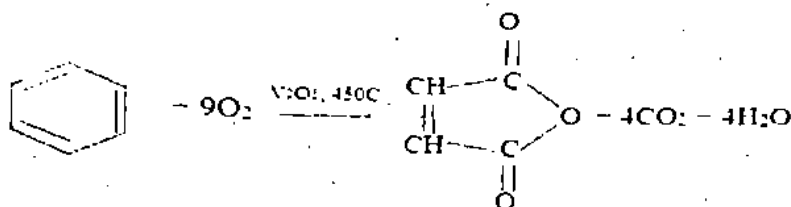
Benzene triozonideGlyoxal

45. How Toluene can be converted to benzoic acid?

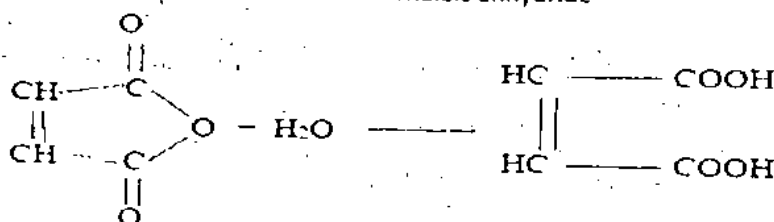
Ans: Alkyl benzenes are readily oxidized by acidified $KMnO_4$ or $K_2Cr_2O_7$. In these reactions, the alkyl groups are oxidized keeping the benzene ring intact.

$$C_6H_5CH_3 + 3[O] \longrightarrow C_6H_5COOH + H_2O$$

Toluene Benzoic acid

46. How benzene is converted into maleic acid by catalytic oxidation? (2 times)

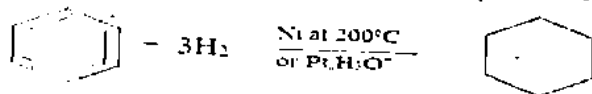
Ans: Benzene ring is destroyed when it is strongly heated with air in the presence of V_2O_5 as a catalyst and maleic acid is obtained.

$$C_6H_6 + 9O_2 \xrightarrow{V_2O_5,\ 450C} \text{Maleic anhydride} + 4CO_2 + 4H_2O$$

Maleic anhydride

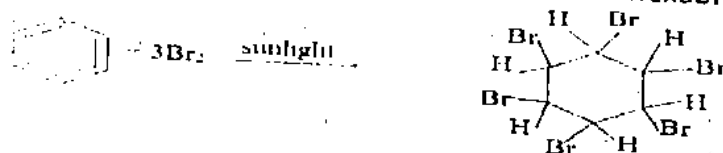
$$\text{Maleic anhydride} + H_2O \longrightarrow \begin{matrix} HC - COOH \\ \| \\ HC - COOH \end{matrix}$$

Maleic anhydride Maleic acid

47. Give two reactions which confirm presence of three double bonds in benzene ring.

Ans (i) Benzene is reduced to cyclohexane on heating at high temperature which hydrogen in the presence of Pt in an acidic solvent (acetic acid) or Ni at 200°C as a catalyst.

$$C_6H_6 + 3H_2 \xrightarrow[\text{or Pt, } H_3O^+]{\text{Ni at } 200^\circ C} C_6H_{12}$$

Benzene Cyclohexane

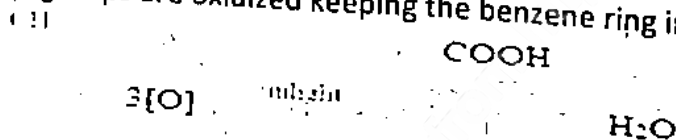
(ii). Benzene reacts with chlorine and bromine in the presence of sunlight to give addition products, hexachlorobenzene or hexabromobenzene.

$$C_6H_6 + 3Br_2 \xrightarrow{\text{sunlight}} C_6H_6Br_6$$

Hexabromobenzene

48. What happens when Acidified $KMnO_4$ is added to Methylbenzene and Ethylbenzene?

Ans **When Acidified $KMnO_4$ is added to Methylbenzene:**

Alkyl benzenes re readily oxidized by acidified $KMnO_4$. In these reactions, the alkyl groups are oxidized keeping the benzene ring intact.

$$C_6H_5CH_3 + 3[O] \longrightarrow C_6H_5COOH + H_2O$$

Methylbenzene Benzoic acid

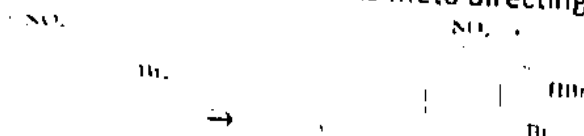
49. When Acidified $KMnO_4$ is added to Ethylbenzene: **(2 Times)**

$$C_6H_5CH_2CH_3 + 6[O] \longrightarrow C_6H_5COOH + 2H_2O + CO_2$$

Ethylbenzene Benzoic acid

Topic No: 9.5.4

50. Predict major product of bromination of nitrobenzens. Also give equation.

Ans: m-bromonitro benzene is the major product of bromination of nitrobenzene, because nitro group on benzene is meta directing as:

51. Why hydroxyl group (OH^-) is ortho and para directing?

Ans: Hydroxyl group release electrons to the benzene ring, thereby facilitating the availability of electrons to the electrophiles at ortho and para positions.

This result in the icreased chemical reactivity of benzene ring toward electrophiles. The benzene ring can offer more than one position to the new incoming groups.

52. Write names of any four ortho – para directing groups?

Ans: $-N(CH_3)_2$, $-NH_2$, $-OH$, $-OCH_3$, $-Cl$, $-Br$, $-I$

53. What is meant by meta directing group? (3 times)

Ans: <u>Meta directing group:-</u>The groups which withdraw the electrons of the benzene ting towards themselves, and reduce the availability to the electrophile are called meta directing groups. The result is the decreased chemical reactivity of benzene. In their presence incoming electrophile will prefer to attack on meta position rather than ortho and para positions. For example: $-N^+R_3$, $-C\equiv N$ etc.

54. What is meant by directive influence of substituent? Give an example?

Ans When an electrophile substitution reaction takes place on the benzene ring, we get only one monsubstituted benzene all the six positions in the ring are equivalent. However introduction of second group into the ring may give three isomeric distributed products, ortho, meta and para.

For example chlorination of nitrobenzene give only meta chloronitro benzene while nitration of chlorobenzene gives orthochloronitrobenzene.

55. How will you prepare 2, 4, 6 – trinitrotoluene from benzene in two steps?

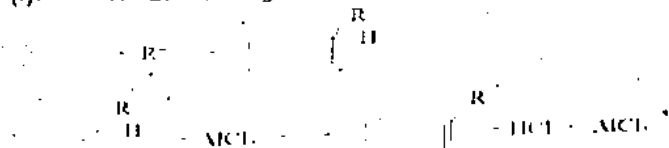
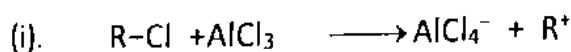
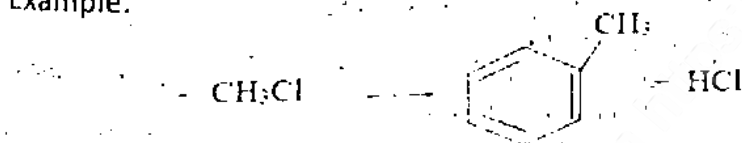
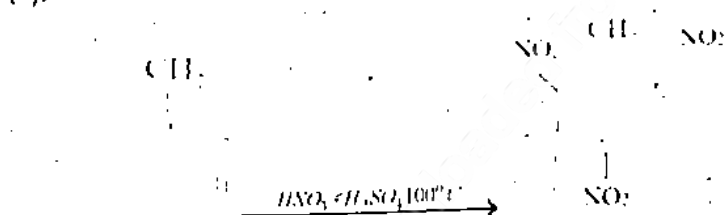
Ans

(i). $R-Cl + AlCl_3 \longrightarrow AlCl_4^- + R^+$

Example:

$+ CH_3Cl \longrightarrow$ (toluene) $+ HCl$

(ii).

$\xrightarrow{HNO_3 / H_2SO_4, 100°C}$

2, 4, 6 – trinitrotoluene

56. How will you prepare o-nitrotoluene from benzene in two steps.

Ans

(i). $R-Cl + AlCl_3 \longrightarrow AlCl_4^- + R^+$

Example:

$C_6H_6 + CH_3Cl \longrightarrow C_6H_5CH_3 + HCl$

(ii).

$C_6H_5CH_3 \xrightarrow{2(HNO_3 + H_2SO_4)\ 30-40°C}$ o-nitrotoluene + p-nitrotoluene

Topic No: 9.6

57. Justify that Ethene (C_2H_4) is more reactive than C_6H_6 / Compare the reactivity of benzene and alkene. (2 Times)

Ans The highly sable, delocalized electrons of benzene ring not readily available for the nucleophilic attack like the electrons of alkenes. Therefore, the electrons of benzne ring do not assist in the attack of weak electrophiles.

2018

58. How will you prepare the following compound from benzene in two steps? / Prepare m-chloronitrobenzene from benzene in two steps. (3 times) m-chloronitro benzene.

Ans: <u>**Preparation of m-chloronitrobenzne:**</u>

<u>**Nitration:**</u> The introduction of NO_2 group in benzene ring is called "Nitration". The nitration of benzene takes place when it is heated with a 1:1 mixture of conc. HNO_3 and conc. H_2SO_4 at 50-55ºC. Sulphuric acid reacts with nitric acid to generate nitronium ion, (NO_2^+).

$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4,\ 55C} C_6H_5NO_2 + H_2O$

$C_6H_5NO_2 + Cl_2 \longrightarrow$ m-$ClC_6H_4NO_2 + HCl$

m-chloronitrobenzne

59. Write structural formulae of following compounds.
(i) Benzyl alcohol (ii) phenyl hydrazine

Ans: <u>**Structural formulae:**</u>

(i) Benzyl alcohol : $C_6H_5CH_2OH$

(ii) Phenyl hydrazine : $C_6H_5NH\text{-}NH_2$

60. Draw structure of (a) methoxy benzene (b) n-dipropyl ether

Ans: (a) methoxy benzene

$C_6H_5OCH_3$

(b) n-dipropyl ether: $CH_3\text{-}CH_2\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH_2\text{-}CH_3$

2019

61. What happens when
(a) Benzene is heated with conc. H_2SO_4 at 250°C.
(b) Chlorine is passed through benzene in sunlight.

Ans:

(a) $C_6H_6 + H_2SO_4 \xrightarrow{230^\circ C} C_6H_5SO_3H + H_2O$

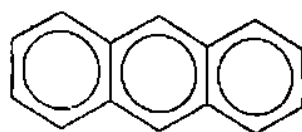
Benzene sulphonic acid

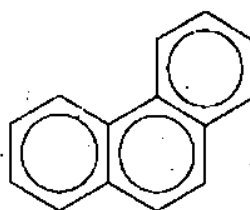
(b) $C_6H_6 + 3Cl_2 \xrightarrow{Sunlight} C_6H_6Cl_6$

1,2,3,4,5,6 – *hexachlorocyclohexane*

62. Write down structures of

(a) Anthracene **(b) Phenanthrene**

Ans: (a) Anthracene

Anthracene

(b) Phenanthrene

Phenanthrene

63. How will you prepare 2, 4, 6 – trinitrotoluene from benzene in two steps

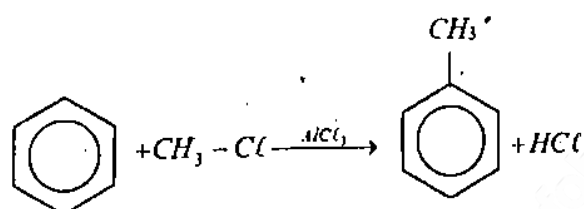
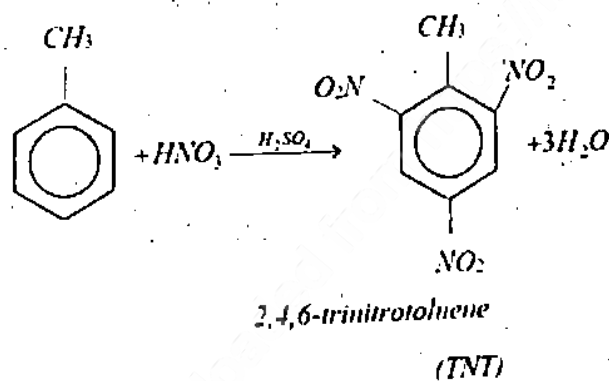
Ans: (i)

$C_6H_6 + CH_3-Cl \xrightarrow{AlCl_3} C_6H_5CH_3 + HCl$

(ii)

$C_6H_5CH_3 + HNO_3 \xrightarrow{H_2SO_4} C_6H_2(CH_3)(NO_2)_3 + 3H_2O$

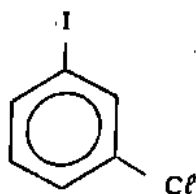
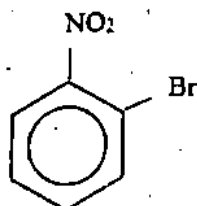
2,4,6-trinitrotoluene

(TNT)

64. Write down structural formulas of followings.

(a) 3 – chloroiodobenzene **(b) 2 – bromonitrobenzene**

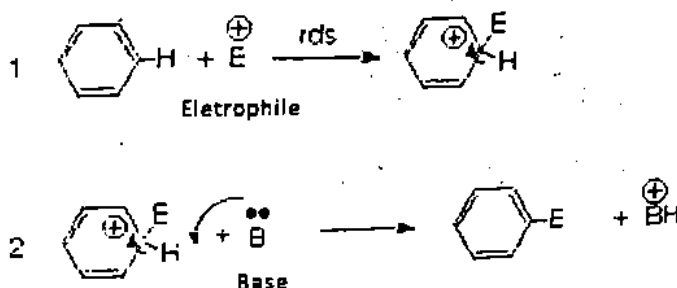
Ans: (a) 3 – chloroiodobenzene

(b) **2 - bromonitrobenzene**

NO_2, Br

65. Give general mechanism of electrophilic substitution reaction of benzene.

Ans: The general mechanism is as follows:

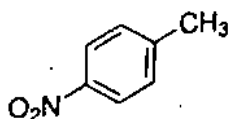
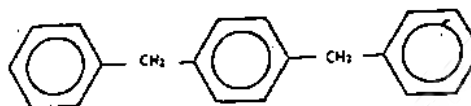
1. Benzene–H + $\overset{\oplus}{E}$ (Eletrophile) $\xrightarrow{rds}$ arenium ion (E, H)

2. Arenium ion (E, H) + $\ddot{B}$ (Base) ⟶ Benzene–E + $\overset{\oplus}{B}H$

66. Write down structural formulas of p – nitrotoluene and p – dibenzylbenzene

Ans: P – nitrotoluene

CH_3, O_2N

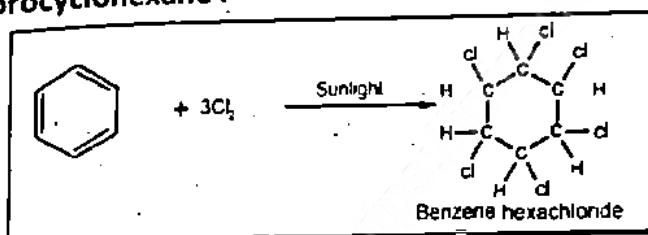
P – dibenzylbenzene

$C_6H_5-CH_2-C_6H_4-CH_2-C_6H_5$

2021

67. Convert benzene into (a) Hexachlorocyclohexane (b) Benzene sulphonic acid.

Ans: **(a) Hexachlorocyclohexane :**

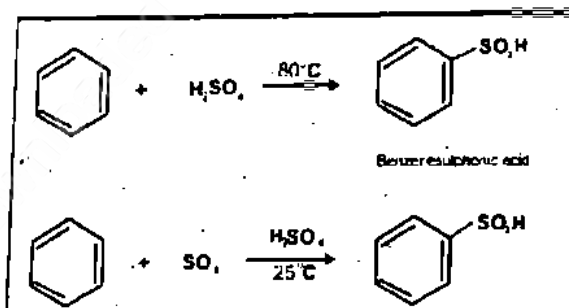
Benzene + $3Cl_2$ $\xrightarrow{Sunlight}$ $C_6H_6Cl_6$

Benzene hexachloride

(b) Benzene sulphonic acid :

The introduction of sulphonic acid group in benzene ring is called Sulphonation. When benzene is heated with fuming H_2SO_4 or conc. H_2SO_4 it yields benzene sulphonic acid.

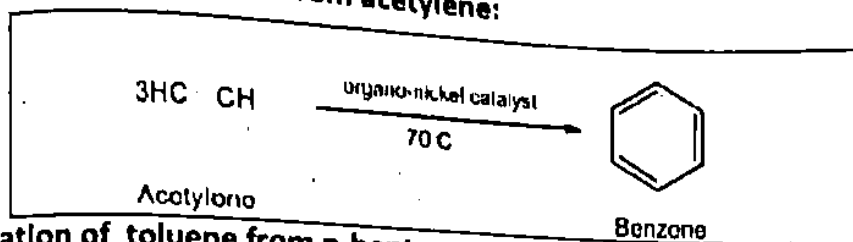
Benzene + H_2SO_4 $\xrightarrow{80°C}$ $C_6H_5SO_3H$

Benzene sulphonic acid

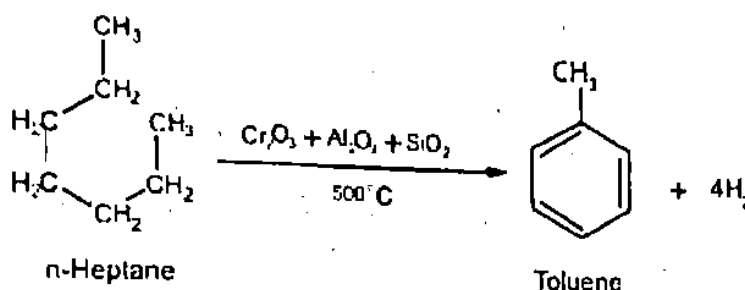
Benzene + SO_3 $\xrightarrow[25°C]{H_2SO_4}$ $C_6H_5SO_3H$

68. **How would you prepare benzene from acetylene and toluene from n-heptane?**

Ans: **Preparation of benzene from acetylene:**

$$3HC \equiv CH \xrightarrow[70\,C]{\text{organo-nickel catalyst}} \text{Benzene}$$

Acetylene Benzene

Preparation of toluene from n-heptane:

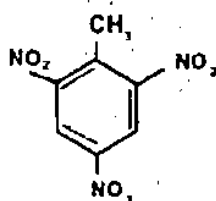
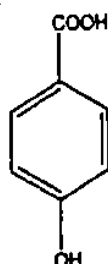
$$\text{n-Heptane} \xrightarrow[500^\circ C]{Cr_2O_3 + Al_2O_3 + SiO_2} \text{Toluene} + 4H_2$$

n-Heptane Toluene

69. **Draw the Structural Formulas for : (a) 2, 4 , 6-Trinitrotoluene (b) p-Hydroxybenzoic Acid**

Ans: **(a) 2, 4 , 6-Trinitrotoluene:**

CH_3, NO_2, NO_2, NO_2

(b) p-Hydroxybenzoic Acid:

COOH, OH

70. **How Aromatic Hydrocarbons are classified?**

Ans: On the basis of the number of benzene rings aromatic hydrocarbons can be categorized into following classes.

(a) Monocyclic Aromatic Hydrocarbons and their derivatives
Monocyclic Aromatic Hydrocarbons and their Derivatives Aromatic hydrocarbons containing one benzene ring in their molecules are called Monocyclic Aromatic Hydrocarbons, e.g. benzene and its derivatives.

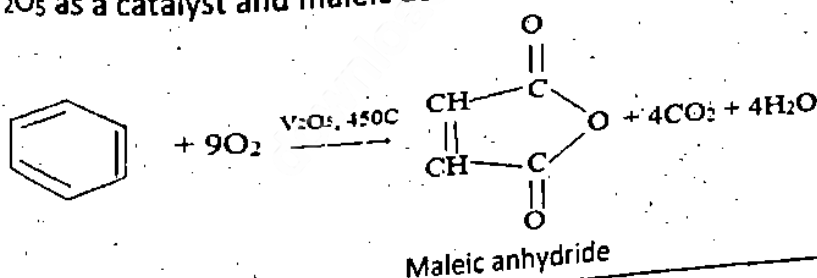
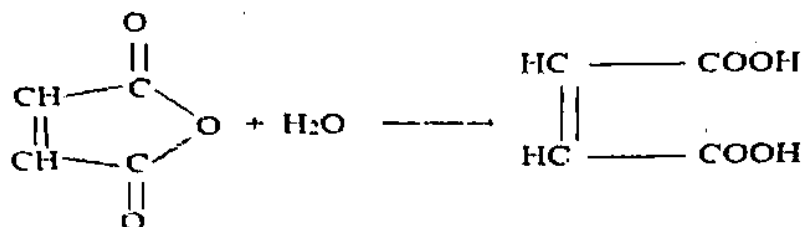
(b) Polycyclic Aromatic Hydrocarbons
Aromatic hydrocarbons containing two or more benzene rings in their molecules are called Polycyclic Aromatic Hydrocarbons. e.g. naphthalene and Biphenyl.

71. **Define the terms with an example (a) Oxidation of Benzene (b) Sulphonation of Benzene.**

Ans: **(a) Oxidation of Benzene:**
Benzene ring is destroyed when it is strongly heated with air in the presence of V_2O_5 as a catalyst and maleic acid is obtained.

$$C_6H_6 + 9O_2 \xrightarrow{V_2O_5,\ 450C} \text{Maleic anhydride} + 4CO_2 + 4H_2O$$

Maleic anhydride

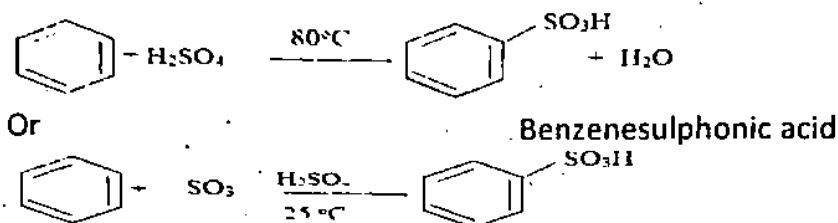
$$CH(CO)_2O + H_2O \longrightarrow HC(COOH)=HC(COOH)$$

(b) Sulphonation of Benzene:

Sulphonation: The introduction of sulphonic acid group in benzene ring is called "Sulphonation". When benzene is heated with fuming H_2SO_4 or conc. H_2SO_4. It yields benzene sulphonic acid.

$$C_6H_6 + H_2SO_4 \xrightarrow{80°C} C_6H_5SO_3H + H_2O$$

Benzenesulphonic acid

Or

$$C_6H_6 + SO_3 \xrightarrow[25°C]{H_2SO_4} C_6H_5SO_3H$$

CHAPTER NO:9 LONG QUESTIONS
AROMATIC HYDROCARBON
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 9.1

1. **Explain classification of aromatic hydrocarbons on the basis of number of rings.**

Ans: (Text Book Page No:170)

Topic No: 9.3.5

2. **Describe the structure of benzene on the basis of atomic orbital treatment.** **(10 times)**

Ans: (Text Book Page No:175)

Topic No: 9.3.7

3. **What is resonance? Explain structure of benzene by resonance method.** **(3 times)**

Ans: (Text Book Page No:177)

Topic No: 9.4

4. **Write four methods for the preparation of benzene.** **(5 times)**

Ans: (Text Book Page No:178)

5. **Discuss two industrial and two laboratory methods to prepare benzene.**

Ans: (Text Book Page No178:)

Topic No: 9.5.2

6. **What are Friedel- Crafts reactions? Explain mechanisms of alkylation and acylation of benzene.** **(10 times)**

Ans: (Text Book Page No:184)

7. **What happens when toluene is reacts with:**

Cl_2 in the presence of sunlight ii) $KMnO_4$ in the presence of H_2SO_4

Ans: (Text Book Page No:182+187)

8. **Convert benzene into : (i) Cyclohexane (ii) Maleic acid (iii) Glyoxal (iv) Benzene sulphonic acid.**

Ans: (Text Book Page No:186)

Topic No: 9.5.2/1

9. How benzene is prepared from cyclohexane, Acetylene alkanes.

Ans: (Text Book Page No:179)

10. Explain the mechanism of halogeneation of benzene.

Ans: (Text Book Page No:182)

Topic No: 9.5.2/2

11. Write the mechanism for: (9 times)
Sulphonation ii) Nitration of Benzene

Ans: (Text Book Page No:183)

12. What is sulphonation? Give its mechanism. (3 times)

Ans: (Text Book Page No:183)

Topic No: 9.5.2/4

13. DefineFriedel Crafts reactions. Give mechanism with an example of Friedel-Craft's acylation reaction. (2 Times)

Ans: (Text Book Page No:184)

14. Describe the Mechanism of Friedalcraft's alkylation of Benzene. (8 times)

Ans: (Text Book Page No:184)

15. What is Friedel Craft's alkylation reaction? Give its mechanism. (2 times)

Ans: (Text Book Page No:184)

Topic No: 9.5.3/1

16. Write four reactions in which benzene behaves as if it is a saturated hydrocarbon.

Ans: (Text Book Page No:181)

Topic No: 9.5.4

17. What is meant by orientation? Why certain substituent's are ortho and apara directive and others are meta directive giving one example.

Ans: (Text Book Page No:188)

18. How will you prepare these compounds from benzene? (3 times)
(i) m-Chloronitrobenzene ii) p-Choronitrobenzene

Ans: (Text Book Page No:188)

19. Predict the major products of bromination of following compounds.
(i) Toluene (ii) nitrobenzene (iii) Bromobenzene (iv) Benzoic acid

Ans: (Text Book Page No:186)

2018

(3 times)

20. Explain stability of Benzene.

Ans: (Text Book Page No:175)

21. Draw structural formulae of following compounds. (i) m-chlorobenzoic acid (ii) P- nitroaniline (iii) 2-amino-5-bromo-3-nitro benzene sulphonic acid (iv) m-nitrophenol

Ans: (Text Book Page No:)

2021

22. How straight chain structures for the benzene is ruled out.
23. Describe Kekule's structure of benzene.
24. Predict the major products of bromination of the following:
(a) Toluene (b) Nitrobenzene (c) Benzaldehyde (d) Benzoic acid
25. Explain the comparison of reactivities of Alkanes, Alkenes & Benzene.

CHAPTER NO:10 OBJECTIVES (MCQ'S) ALKYL HALIDES IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 10.1

1- In primary alkyl halides the halogen atom is attached to a carbon which is further attached to how many carbon atoms: (2 times)

(a) Four (b) Three (c) Two (d) One

Topic No: 10.4

2. The reactivity of Grignard's reagent is due to: (7 times)

(a) Polarity of Mg-X bond (b) Polarity of C-Mg bond
(c) Electronegativity of halogen atom (d) Presence of Mg atom

3. Which one is most reactive alkyl halide?

(a) RI (b) RBr (c) RCl (d) RF

Topic No: 10.5

4. For which mechanism, the first step involved is the same: (11 times)

(a) E1 and E2 (b) E_1 and S_N1 (c) E_1 and S_N2 (d) E_2 and S_N2

5. Which of the following is electrophile?

(a) NH_3 (b) H_2O (c) BF_3 (d) Cl

Topic No: 10.5.1

6. Which one of the following is not a nucleophile? (14 times)

(a) H_2O (b) H_2S (c) BF_3 (d) NH_3

7- Which one of following is best nucleophile? (2 times)

(a) H_2O (b) NH_3 (c) $C_2H_5O^-$ (d) NO

8. Which one is the best leaving group?

(a) I^{-1} (b) Br^{-1} (c) Cl^{-1} (d) F^{-1}

Topic No: 10.5.2

9. In S_N2 mechanism, the rate of bond formation is ____________ bond breakage?

(a) less than (b) equal to (c) greater than (d) cannot be predicted

10. Order and molecularity, of S_N2 reaction of alkyl halidc is:

(a) 1,2 (b) 2,1 (c) 2,2 (d) 0,1

11- S_N2 reactions can be carried out with: (5 times)

(a) primary alkyl halides (b) secondary alkyl halides (c) tertiary alkyl halides (d) all of these

Topic No: 10.5.3

12. Elimination bimolecular reactions involve: (8 times)

(a) First order kinetics (b) Second order kinetics
(c) Third order kinetics (d) Zero order kinetics

13. Ethyl bromide reacts with aqueous KOH to produce is:

(a) Ethene (b) Ethane (c) Ethanol (d) Elhanoic acid

Topic No: 10.6

14. Which one of the following with Grignard's reagent can give p°- alcohol? (2 times)

(a) Epoxide (b) Peroxide (c) Super Oxide (d) Hydrogen oxide

15. When CO_2 is made to react with Ethyl Magniesium Iodide, followed by Acid hydrolysis, product formed is: (7 times)

(a) Propane (b) Propanoic acid (c) Propanol (d) Propanal

2018

16. The rate of E1 reaction depends upon: (2 times)

(a) The concentration of substrate (b) The concentration of nucleophile
(c) The concentration of substrate as well as nucleophile (d) none of these

2021

17. Alkanenitriles can be prepared by treating alkyl halide with:

(a) Alcoholic KOH (b) Alcoholic KCN (c) Aqueous KOH (d) Aqueous KNO_3

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	A	B	C	C	C	A	B	C	A	B	C	A	B	A
17															
B															

CHAPTER NO:10 ALKYL HALIDES
SHORT QUESTIONS
IN ALL PUNJAB BOARD PAPERS-2011-2021

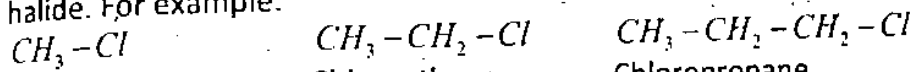
Topic No: 10.1

1. What are primary and tertiary Alkyl Halides? Give examples. (5 times)

Ans: In a primary alkyl halide halogen atom is attached with a carbon which is further attached to one or no carbon atom. For example: CH_3Cl, $CH_3\text{-}CH_2\text{-}Cl$ etc.

In a tertiary alkyl halide halogen atom is attached with a carbon which is further attached to three carbon atoms. For example: $(CH_3)_3C\text{-}Cl$ (2-chloro,2-methylpropane) etc.

2. Define Primary Alkyl Halids and secondary alkyl Halids give example of each. (2 times)

Ans: **Primary Alkyl Halids**: The alkyl halids in which halogen atom is attached with a carbon which is further attached to one or no carbon atom is called primary alkyl halide. For example:

CH_3-Cl Chloromethane; CH_3-CH_2-Cl Chloroethane; $CH_3-CH_2-CH_2-Cl$ Chloropropane

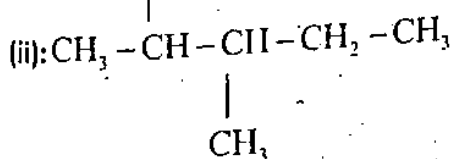
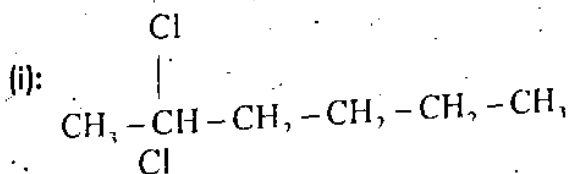
Secondary alkyl Halids: The alkyl halids in which halogen atom is attached with a carbon which is further attached to two carbon atom is called secondary alkyl halide. For example: $(CH_3)_2C-Cl$ 2-Chloropropane

Topic No: 10.2

3. Draw two possible structures that have molecular formula $C_6H_{13}Cl$

Ans:

(i): $CH_3-CH(Cl)-CH_2-CH_2-CH_2-CH_3$

(ii): $CH_3-CH(Cl)-CH(CH_3)-CH_2-CH_3$

Topic No: 10.3

4. Prepare alkyl halides from alcohols by two methods? (7 times)

Ans: (i).. Alcohol may be converted to the corresponding alkyl halides by the action of halogen acid in the presence of $ZnCl_2$ which acts as a catalyst.

$$CH_3\text{-}CH_2\text{-}OH + HX \xrightarrow{ZnCl_2} CH_3\text{-}CH_2\text{-}X + H_2O$$

(ii).. Alcohols react with thionyl chloride in pyridine as a solvent to give alkyl chlorides. This method is especially useful since the by-products (HCl, SO_2) are gases, which escape leaving behind the pure product.

$$R\text{-}OH + SOCl_2 \xrightarrow{Pyridine} R\text{-}Cl + SO_2 + HCl$$

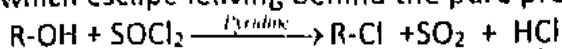
5. Write down any two methods for the preparation of Alkyl halides?

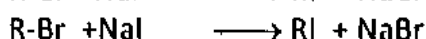
Ans: (i).. **Preparation of alkyl halides from alcohols:-**

(a).. Alcohol may be converted to the corresponding alkyl halides by the action of halogen acid in the presence of $ZnCl_2$ which acts as a catalyst.

$$CH_3\text{-}CH_2\text{-}OH + HX \xrightarrow{ZnCl_2} CH_3\text{-}CH_2\text{-}X + H_2O$$

(b).. Alcohols react with thionyl chloride in pyridine as a solvent to give alkyl chlorides. This method is especially useful since the by-products (HCl, SO_2) are gases, which escape leaving behind the pure product.

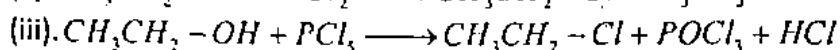
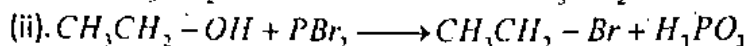
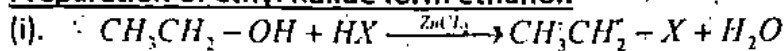
$$R\text{-}OH + SOCl_2 \xrightarrow{Pyridine} R\text{-}Cl + SO_2 + HCl$$

(ii).. A method for the preparation of simple alkyl iodide is carried out by reaction of alkyl chloride or alkyl bromide with sodium iodide.

$$R\text{-}Cl + NaI \longrightarrow RI + NaCl$$
$$R\text{-}Br + NaI \longrightarrow RI + NaBr$$

6. Describe two methods of preparation of ethyl halide form ethanol. (2 times)

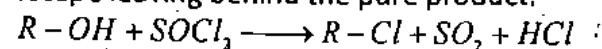
Ans: **Preparation of ethyl halide form ethanol:**

(i). $CH_3CH_2-OH + HX \xrightarrow{ZnCl_2} CH_3CH_2-X + H_2O$

(ii). $CH_3CH_2-OH + PBr_3 \longrightarrow CH_3CH_2-Br + H_3PO_3$

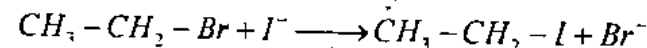
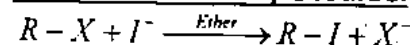
(iii). $CH_3CH_2-OH + PCl_5 \longrightarrow CH_3CH_2-Cl + POCl_3 + HCl$

7. How will you prepare Ethyl chloride using thionylchloride.

Ans: Alcohols react with thionyl chloride in pyridine as a solving to give alkyl chlorides. This method is especially useful since the by-products (HCl, SO_2) are gases, which escape leaving behind the pure product.

$$R-OH + SOCl_2 \longrightarrow R-Cl + SO_2 + HCl$$

8. Write excellent method to prepare alkyle iodide. (4 times)

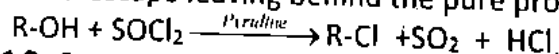
Ans: **Preparation of alkyle iodide:**

$$R-X + I^- \xrightarrow{Ether} R-I + X^-$$

$$CH_3-CH_2-Br + I^- \longrightarrow CH_3-CH_2-I + Br^-$$

9. $SOCl_2$ is the best reagent to get alkyl chloride from alcohols. Write equation including solvent necessary to complete their reaction. (4 times)

Ans: **Preparation of alkyl chloride from alcohols:**

Alcohols react with thionyl chloride in pyridine as a solvent to give alkyl chlorides. This method is especially useful since the by-products (HCl, SO_2) are gases, which escape leaving behind the pure product.

$$R\text{-}OH + SOCl_2 \xrightarrow{Pyridine} R\text{-}Cl + SO_2 + HCl$$

Topic No: 10.4

10. Why alkyl halides are more reactive than alkanes?

Ans: An alkyl halide molecule consists of two parts, an alkyl group with a partial positive charge on the carbon atom attached to halogen atom and the halide atom with a partial negative charge. While alkanes have no partial positive or negative charged sites in their molecules.

Halogen atom attached to alkyl group is more electronegative which makes the alkyl and halide bond weak. The electronegativity difference causes the polarity in alkyl halide molecules. Thus alkyl halide molecule becomes more reactive than simple alkanes due to bond energy and polarity factors.

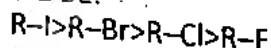
11. Write down the main factors on which reactivity of Alkyl halides depends. (2 times)

Ans: **Factors depending upon reactivity of Alkyl halides:**

There are two main factors which govern the reactivity of R-X bond.

(i). **C–X bond energy:**

Strength of bond in iodo compound (with weakest bonds) would be the most reactive one while fluoro compound will be the least reqctive i.e. the order of reactivity of alkyl halides should be:

$$R-I > R-Br > R-Cl > R-F$$

(ii). **C–X bond polarity:**

The greatest electronegativity difference exists between carbon and fluorine atoms in alky fluorides. If an electrophile is the attaching reagent then this difference suggests that alkyl fluorides would be the most reactive alkyl halides.

12. Why the reactivity of Alkyl Halids depends upon Bond Energy.

Ans: **Reactivity of Alkyl Halid:** The strength of bond show that iodo compound (with

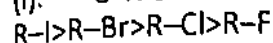
the weakest bonds) would be the most reactive one whilefluoro compound will be the leat reactive I.e. the order of reactivity of alkyl halid should be

R–I>R–Br>R–Cl>R–F

13. **Why 'R-X' are reactive compound?**

Ans: An alkyl halide molecule (R-X) consists of two parts, an alkyl group with a partial positive charge on the carbon atom attached to halogen atom and the halide atom with a partial negative charge. While alkanes have no partial positive or negative charged sites in their molecules.

There are two main factors which govern the reactivity of R-X bond.

(i). C–X bond energy: (ii). C–X bond polarity:

R–I>R–Br>R–Cl>R–F

Halogen atom attached to alkyl group is more electronegative which makes the alkyl and halide bond weak. The electronegativity difference causes the polarity in alkyl halide molecules. Thus alkyl halide molecule becomes more reactive than simple alkanes due to bond energy and polarity factors.

Topic No: 10.5

14. **Explain terms: (i).. Leaving group (ii).. Electrophile (2 times)**

Ans: (i).. Leaving group: Leaving group is nucleophile which leaves during substitution reaction of alkyl halide. It departs with an unshared pair of electrons. If we wish a S_N reaction to proceed in the forward direction the incoming nucleophile must be stronger than the departing one. Cl^-,Br^-, I^-, HSO_4^- are good leaving groups. Poor leaving groups are OH^-, OR^- and NH_2^-. Iodide ion is a good nucleophile as well as a good leaving group.

(ii).. Electrophile: It is a specie which attracts electrons (electron loving). The carbon atom of an alkyl group attaches with the halogen atom and bearing a partial positive charge is called an electrophile center. An electrophile may be neutral or positively charged.

Topic No: 10.5.1

15. **What is leaving group? Give examples. (5 times)**

Ans: Leaving group:-Leaving group is nucleophile which leaves during substitution reaction of alkyl halide. It departs with an unshared pair of electrons. If we wish a S_N reaction to proceed in the forward direction the incoming nucleophile must be stronger than the departing one. Cl^-,Br^-, I^-, HSO_4^- are good leaving groups. Poor leaving groups are OH^-, OR^- and NH_2^-. Iodide ion is a good nucleophile as well as a good leaving group.

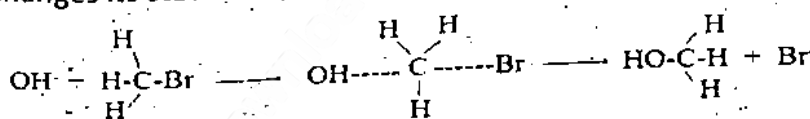
16. **Define electrophile and nucleophile? (11 times)**

Ans: Electrophile: It is a specie which attracts electrons (electron loving). The carbon atom of an alkyl group attaches with the halogen atom and bearing a partial positive charge is called an electrophilic center. An electrophile may be neutral or positively charged.

Nucleophile: Nucleophile means nucleus loving. It has an unshared electron pair available for bonding and in most cases it is basic in character. It may have negatively charged or neutral. For example: HO^-, Cl^-,Br^-,I^-, NH_3 etc.

17. **Why does SN_2 mechanism give a product with inversion of configuration? Show with one reaction.**

Ans: In nucleophilic substitution bimolecular (S_N2) the direction of attack of the attaching nucleophile is from the side which is opposite to the leaving group. In order to give to the nucleophile enough room to attack, the substrate carbon atom changes its state of hybridization from tetrahedral sp^3 to planar sp^2.

$$OH^- + H\text{-}\underset{H}{\overset{H}{C}}\text{-}Br \longrightarrow OH\cdots\underset{H}{\overset{H\ H}{C}}\cdots Br \longrightarrow HO\text{-}\underset{H}{\overset{H}{C}}\text{-}H + Br^-$$

Attacking group Transition state Inverted molecule Leaving group

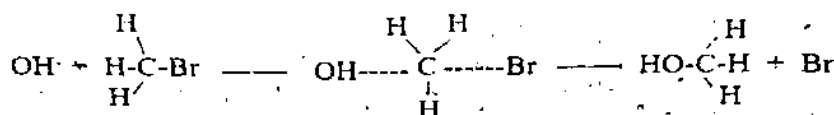
Topic No: 10.5.2

18. **During S_N1 reaction. What is the significance of first step?**

Ans: The first step involved the breakage of a covalent bond so it is a slow step as compared to the second step which involves the energetically favourable combination of ions. The first step is, therefore, called the rate-determining step. The mechanism is called unimolecular because only one molecule takes part in the rate determining step.

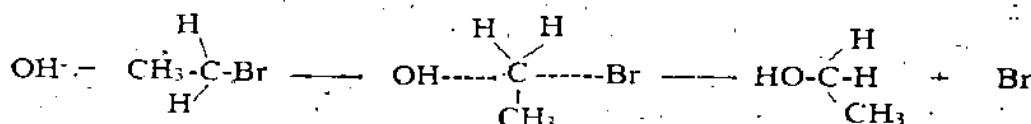
19. Give general mechanism patterns of S_N2 reaction? (5 times)

Ans: In nucleophilic substitution bimolecular (S_N2) the direction of attack of the attaching nucleophile is from the side which is opposite to the leaving group. In order to give to the nucleophile enough room to attack, the substrate carbon atom changes its state of hybridization from tetrahedral sp^3 to planar sp^2:

$$OH^- + H\text{-}\overset{H}{\underset{H}{C}}\text{-}Br \longrightarrow OH\text{-----}\overset{H\ H}{\underset{H}{C}}\text{-----}Br \longrightarrow HO\text{-}\overset{H}{\underset{H}{C}}\text{-}H + Br^-$$

Attacking group — Transition state — Inverted molecule — Leaving group

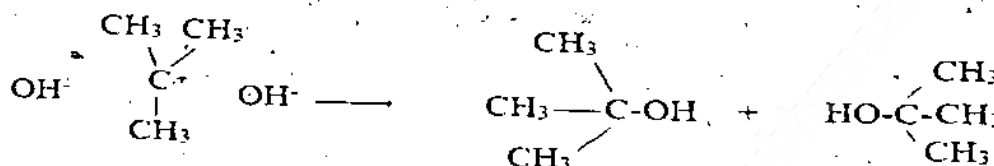
20. Reaction of ethyl bromide with OH nucleophile is S_N2. Justify?

Ans: In nucleophilic substitution bimolecular (S_N2) the direction of attack of OH^-, the attaching nucleophile is from the side which is opposite to the leaving group. In order to give to the nucleophile enough room to attack on ethyl bromide, the substrate carbon atom changes its state of hybridization from tetrahedral sp^3 to planar sp^2.

$$OH^- + CH_3\text{-}\overset{H}{\underset{H}{C}}\text{-}Br \longrightarrow OH\text{-----}\overset{H\ H}{\underset{CH_3}{C}}\text{-----}Br \longrightarrow HO\text{-}\overset{H}{\underset{CH_3}{C}}\text{-}H + Br^-$$

Transition state — Inverted molecule — Leaving group

21. Inversion of configuration is 50% in S_N1 mechanism. Explain?

Ans: **Inversion of configuration:-** In S_N1 mechanism, the nucleophile attacks when the leaving group had already gone, carbocation is a planar specie allowing the nucleophile to attack on it from both the directions with equal ease. We, therefore, observe 50% inversion of configuration and 50% retention of configuration.

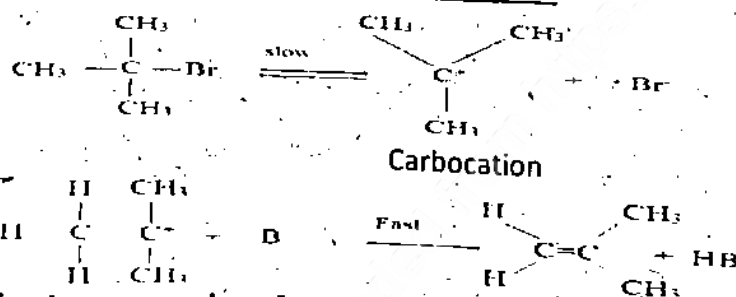
$$OH^- \quad \overset{CH_3\ CH_3}{\underset{CH_3}{C^+}} \quad OH^- \longrightarrow CH_3\text{—}\overset{CH_3}{\underset{CH_3}{C}}\text{-}OH + HO\text{-}\overset{CH_3}{\underset{CH_3}{C}}\text{-}CH_3$$

Retention of conf. — Inversion of conf.

22. Complete the elimination reaction in two steps when a base B attacks on t-butyl bromide?

Ans: **Completion of the elimination reaction:-**

$$CH_3\text{—}\overset{CH_3}{\underset{CH_3}{C}}\text{—}Br \overset{slow}{\rightleftharpoons} \overset{CH_3\ \ CH_3}{\underset{CH_3}{C^+}} + Br^-$$

Carbocation

$$H\text{-}\overset{H}{\underset{H}{C}}\text{-}\overset{CH_3}{\underset{CH_3}{C^+}} + B \xrightarrow{Fast} \overset{H}{\underset{H}{}}C{=}C\overset{CH_3}{\underset{CH_3}{}} + HB$$

23. Give two examples of nucleophilic substitution reactions?

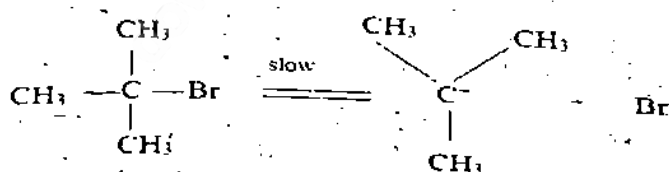
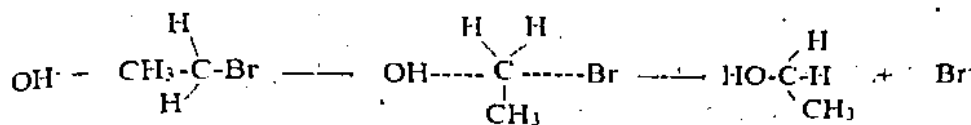
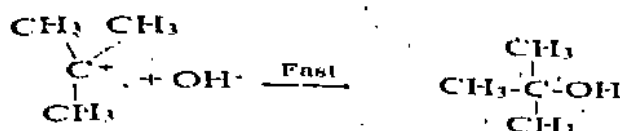
Ans: (i) S_N1 Two step reaction mechanism:

Step 1:

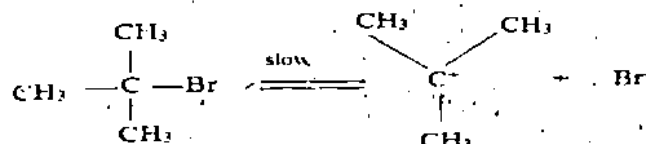
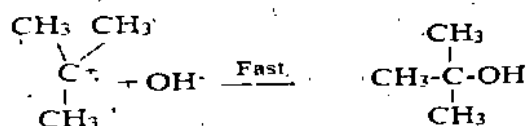
$$CH_3\text{—}\overset{CH_3}{\underset{CH_3}{C}}\text{—}Br \overset{slow}{\rightleftharpoons} \overset{CH_3\ \ CH_3}{\underset{CH_3}{C^+}} + Br^-$$

Step 2:

$$(CH_3)_3C^+ + OH^- \xrightarrow{Fast} CH_3-\underset{CH_3}{\overset{CH_3}{C}}-OH$$

$$OH^- + CH_3-CHBr(H) \longrightarrow OH\text{-----}C(H)(H)(CH_3)\text{------}Br \longrightarrow HO-C(H)(H)-CH_3 + Br^-$$

24. Give mechanism of S_N1 reaction? **(2 times)**

Ans: **Mechanism of S_N1 reaction:-**

Step 1:

$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Br \underset{}{\overset{slow}{\rightleftharpoons}} (CH_3)_3C^+ + Br^-$$

Step 2:

$$(CH_3)_3C^+ + OH^- \xrightarrow{Fast} CH_3-\underset{CH_3}{\overset{CH_3}{C}}-OH$$

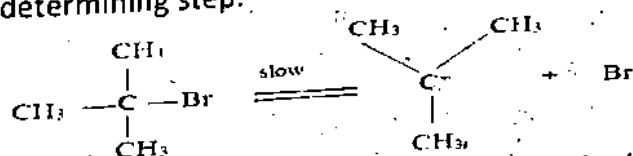
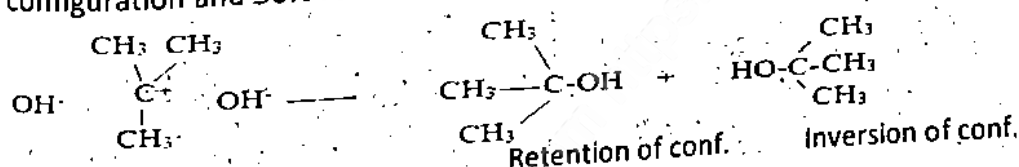
The first step involved the breakage of a covalent bond so it is a slow step as compared to the second step which involves the energetically favourable combination of ions. The first step is therefore called the rate-determining step. The mechanism is calledunimolecular because only one molecule takes part in the rate determining stip.

25. What is the role of stability of carbonium ion in deciding the Mechanism of substitution reaction.

Ans: The first step involved the breakage of a covalent bond so it is a slow step as compared to the second step which involves the energetically favourable combination of ions. The first step is, therefore, called the rate-determining step. The mechanism is called unimolecular because only one molecule takes part in the rate determining step.

$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Br \underset{}{\overset{slow}{\rightleftharpoons}} (CH_3)_3C^+ + Br^-$$

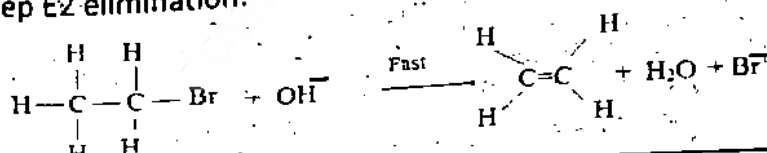
In S_N1 mechanism, the nucleophile attacks when the leaving group had already gone, carbocation is a planar specie allowing the nucleophile to attack on it from both the directions with equal ease. We, therefore, observe 50% inversion of configuration and 50% retention of configuration.

$$OH^- \quad (CH_3)_3C^+ \quad OH^- \longrightarrow \underset{\text{Retention of conf.}}{CH_3-C(CH_3)(CH_3)-OH} + \underset{\text{Inversion of conf.}}{HO-C(CH_3)(CH_3)-CH_3}$$

Topic No: 10.5.3

(4 times)

26. Discuss E2 mechanism.

Ans: **E2 mechanism:-**In E2 mechanism, the nucleophile attacks and the leaving group leaves at the same time with a formation of carbon-carbon double bond. The single step E2 elimination:

$$H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-Br + OH^- \xrightarrow{Fast} H_2C{=}CH_2 + H_2O + Br^-$$

27. What are elimination reactions? Give example of E1 reactions. (3 times)

Ans: When nucleophile attacks on hydrogen atom attached to the β-carbon of the alkyl halide, we get an alkene, such type of reactions are called elimination reactions.

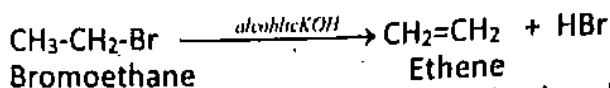
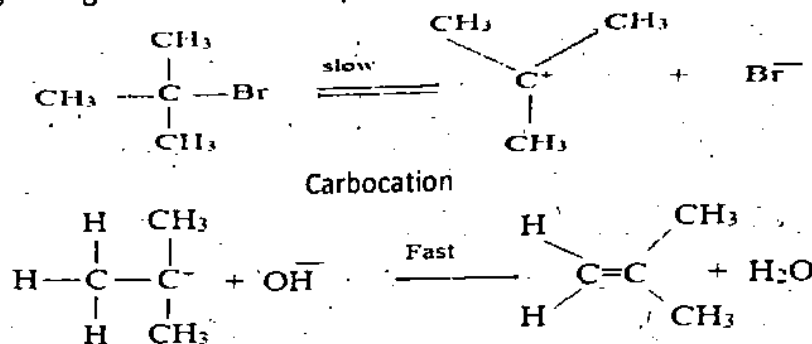
$$CH_3-CH_2-Br \xrightarrow{alcoholic\ KOH} CH_2=CH_2 + HBr$$

Bromoethane → Ethene

Example: In E1 mechanism, the first step is the slow ionization of the substrate to give a carbocation. In the second step, the nucleophile attacks on hydrogen to give an alkene as a product.

$$(CH_3)_3C-Br \xrightleftharpoons{slow} (CH_3)_3C^+ + Br^-$$

Carbocation

$$H_3C-\overset{CH_3}{C^-}(CH_3) + \overline{OH} \xrightarrow{Fast} (H)_2C=C(CH_3)_2 + H_2O$$

28. How will you convert CH_3-CH_3 to $(CH_3-CH_2)_4N^+Br^-$? (2times)

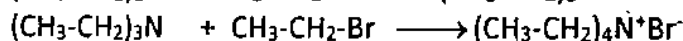
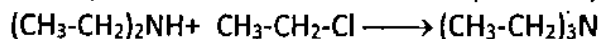
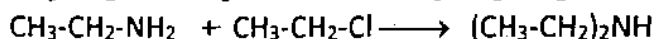
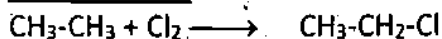
Ans: **Conversions:-**

$CH_3-CH_3 + Cl_2 \longrightarrow CH_3-CH_2-Cl$

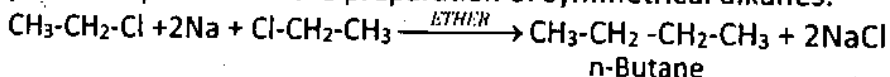
$CH_3-CH_2-Cl + NH_3 \longrightarrow CH_3-CH_2-NH_2$

$CH_3-CH_2-NH_2 + CH_3-CH_2-Cl \longrightarrow (CH_3-CH_2)_2NH$

$(CH_3-CH_2)_2NH + CH_3-CH_2-Cl \longrightarrow (CH_3-CH_2)_3N$

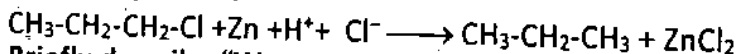
$(CH_3-CH_2)_3N + CH_3-CH_2-Br \longrightarrow (CH_3-CH_2)_4N^+Br^-$

29. Prepare n-Butane by Wurtz's reactions?

Ans: Alkyl halides react with sodium in ether solvent to give alkanes. The reaction is particularly useful for the preparation of symmetrical alkanes.

$$CH_3-CH_2-Cl + 2Na + Cl-CH_2-CH_3 \xrightarrow{ETHER} CH_3-CH_2-CH_2-CH_3 + 2NaCl$$

n-Butane

30. How is reduction of 1-chloropropane done to prepare propane?

Ans: Alkyl halides can be reduced with zinc in the presence of an aqueous acid such as HCl or CH_3COOH.

$$CH_3-CH_2-CH_2-Cl + Zn + H^+ + Cl^- \longrightarrow CH_3-CH_2-CH_3 + ZnCl_2$$

31. Briefly describe "Wurtz synthesis"? / Prepare n-butane by Wurtz Synthesis. / Describe Wurtz Synthesis for the preparation of Alky Halides. / What is Wurtz synthesis ? Give its reaction. (6 times)

Ans: Alkyl halides react with sodium in ether solvent to give alkanes. The reaction is particularly useful for the preparation of symmetrical alkanes.

$$CH_3-CH_2-Cl + 2Na + Cl-CH_2-CH_3 \xrightarrow{Ether.} CH_3-CH_2-CH_2-CH_3 + 2NaCl$$

n-Butane

32. What are β-Elimination reactions? (3 times)

Ans: When nucleophile attacks on hydrogen atom attached to the β-carbon of the alkyl halide, we get an alkene, such type of reactions are called elimination reactions.

$$CH_3-CH_2-Br \xrightarrow{alcoholic\ KOH} CH_2=CH_2 + HBr$$

Bromoethane → Ethene

Example: In E1 mechanism, the first step is the slow ionization of the substrate to give a carbocation. In the second step, the nucleophile attacks on hydrogen to give an alkene as a product.

$$(CH_3)_3C-Br \xrightleftharpoons{slow} (CH_3)_3C^+ + Br^-$$

Carbocation

$$H-\underset{H}{\overset{H}{C}}-\underset{CH_3}{\overset{CH_3}{C^+}} + OH^- \xrightarrow{Fast} \underset{H}{\overset{H}{}}\!>C=C<\!\underset{CH_3}{\overset{CH_3}{}} + H_2O$$

33. Convert ethyl bromide into quaternary ethyl ammonium bromide.

Ans: Conversion of ethyl bromide into quaternary ethyl ammonium bromide:

$$CH_3-CH_2-Br+NH_3 \longrightarrow CH_3-CH_2-NH_2+HBr$$

Ethylamine

$$CH_3-CH_2-Br+CH_3-CH_2-NH_2 \longrightarrow (CH_3-CH_2)_2-NH+HBr$$

Diethylamine

$$CH_3-CH_2-Br+(CH_3-CH_2)_2-NH \longrightarrow (CH_3-CH_2)_3-N+HBr$$

Triethylamine

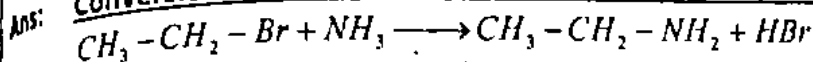
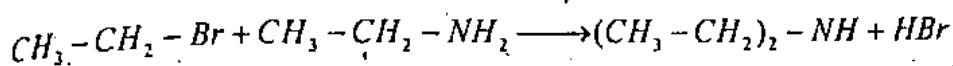
$$CH_3-CH_2-Br+(CH_3-CH_2)_3-N \longrightarrow (CH_3-CH_2)_4-N^+ +HBr$$

34. Convert Ethyl Bromide into Ethyl Alcohol and Ethene.

Ans: Conversion of ethyl bromide into ethyl alcohol and ethene:

(i). $CH_3-CH_2-Br+OH^- \longrightarrow CH_3-CH_2-OH+Br^-$

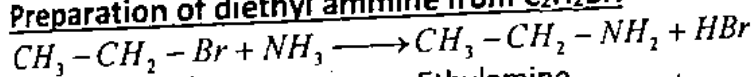
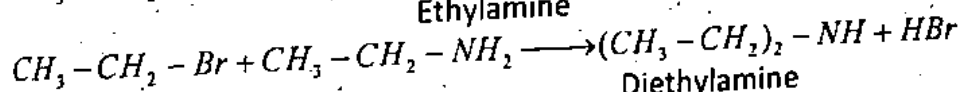
(ii). Alkyl halid on heating with alcoholic potassium hydroxide undegodehydrohalogenation i.e. elimination of a halogen atom together with a hydrogen atom from adjacent carbon atoms.

$C_2H_5Br+KOH \xrightarrow{Alcohol} CH_2=CH_2 + KBr + H_2O$

35: How will you prepare diethyl ammine from C_2H_2Br. **(2 times)**

Ans: Preparation of diethyl ammine from C_2H_2Br:

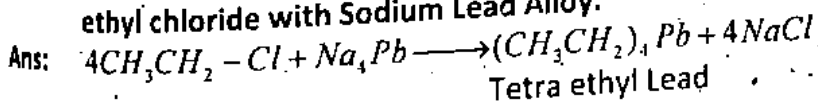
$$CH_3-CH_2-Br+NH_3 \longrightarrow CH_3-CH_2-NH_2+HBr$$

Ethylamine

$$CH_3-CH_2-Br+CH_3-CH_2-NH_2 \longrightarrow (CH_3-CH_2)_2-NH+HBr$$

Diethylamine

Quaternary ethylamine

36. Convert C_2H_5Cl to T.E.L (Tetra ethyl Lead). Write reactions of methyl chloride and ethyl chloride with Sodium Lead Alloy. **(3 times)**

Ans: $4CH_3CH_2-Cl+Na_4Pb \longrightarrow (CH_3CH_2)_4Pb+4NaCl$

Tetra ethyl Lead

37. Give mechanism of E_1 elimination reaction in two steps.

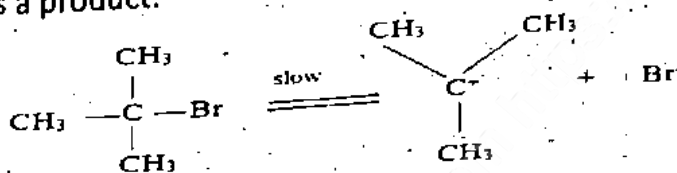
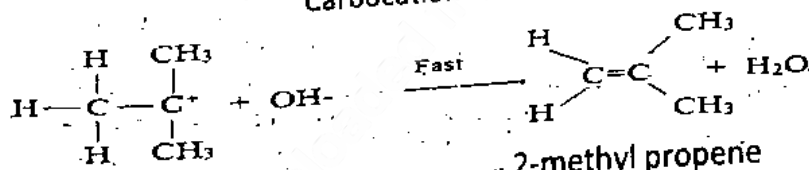
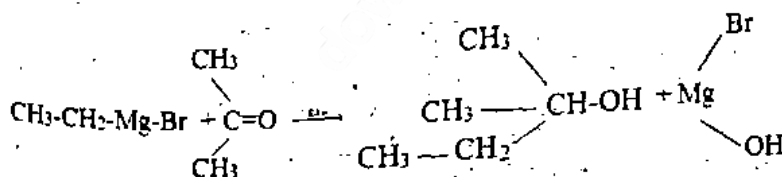
Ans: In E1 mechanism, the first step is the slow ionization of the substrate to give a carbocation. In the second step, the nucleophile attacks on hydrogen to give an alkene as a product.

$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Br \overset{slow}{\rightleftharpoons} \underset{CH_3}{\overset{CH_3\quad CH_3}{C^+}} + Br^-$$

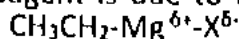
Carbocation

$$H-\underset{H}{\overset{H}{C}}-\underset{CH_3}{\overset{CH_3}{C^+}} + OH^- \xrightarrow{Fast} \underset{H}{\overset{H}{}}\!>C=C<\!\underset{CH_3}{\overset{CH_3}{}} + H_2O$$

2-methyl propene

$$CH_3-CH_2-Mg-Br + \underset{CH_3}{\overset{CH_3}{>}}C=O \longrightarrow \underset{CH_3-CH_2}{\overset{CH_3}{CH_3-}}CH-OH + Mg<\!\underset{OH}{\overset{Br}{}}$$

Topic No: 10.6

38. What is the nature of C-Mg bond in R-Mg-X?

Ans: The reactivity of Grignard reagent is due to the nature of C-Mg bond which is highly polar. $CH_3CH_2\text{-}Mg^{\delta+}\text{-}X^{\delta-}$

Magnesium is more electropositive than carbon and the C-Mg bond though covalent is highly polar, giving alkyl carbon the partial negative charge. This negative charge is an unusual character which makes the alkyl group highly reactive toward electrophile centers. Mostly reactions shown by Grignard reagent are exothermic.

39. Give the importance of Grignard's reagents?

Ans: Grignard reagent is so important in organic synthesis that almost all the classes of organic compounds can be prepared from them. Due to their importance and applications Victor Grignard was awarded Nobel prize in chemistry.

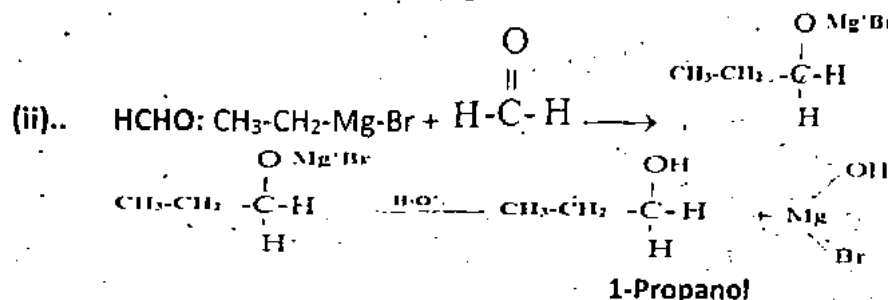
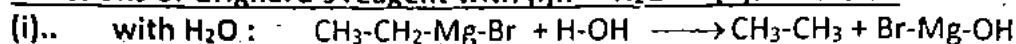
40. Write the reactions of Grignard,s reagent with (i) H_2O ii) HCHO (2 times)

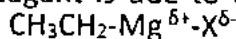
Ans: **Reactions of Grignard's reagent with (i).. H_2O (ii).. HCHO**

(i).. **with H_2O :** $CH_3\text{-}CH_2\text{-}Mg\text{-}Br + H\text{-}OH \longrightarrow CH_3\text{-}CH_3 + Br\text{-}Mg\text{-}OH$

(ii).. **HCHO:** $CH_3\text{-}CH_2\text{-}Mg\text{-}Br + H\text{-}\overset{\overset{O}{||}}{C}\text{-}H \longrightarrow CH_3\text{-}CH_2\text{-}\overset{\overset{OMgBr}{|}}{\underset{\underset{H}{|}}{C}}\text{-}H$

$CH_3\text{-}CH_2\text{-}\overset{\overset{OMgBr}{|}}{\underset{\underset{H}{|}}{C}}\text{-}H \xrightarrow{H_2O} CH_3\text{-}CH_2\text{-}\overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}}\text{-}H + Mg(OH)Br$

1-Propanol

41. Give reason for reactivity of Grignard's reagent?

Ans: The reactivity of Grignard reagent is due to the nature of C-Mg bond which is highly polar. $CH_3CH_2\text{-}Mg^{\delta+}\text{-}X^{\delta-}$

Magnesium is more electropositive than carbon and the C-Mg bond though covalent is highly polar, giving alkyl carbon the partial negative charge. This negative charge is an unusual character which makes the alkyl group highly reactive toward electrophile centers. Mostly reactions shown by Grignard reagent are exothermic.

42. Write a note on R-Mg-X.

Ans: <u>R-Mg-X</u> :R-Mg-X are known as Grignard reagents. These are derivatives of alkyl halides belonging to class of organo-metallic compounds. Grignard reagent was first prepared by Victor Grignard in 1900.

Grignard reagent is so important in organic synthesis that almost all the classes of organic compounds can be prepared from them. Due to their importance and applications Victor Grignard was awarded Nobel prize in chemistry.

43. What products are formed when Ethyl magnesium bromide is treated with :
(i).. HCHO (ii).. CO_2 (2 times)

Ans: (i)..HCHO

$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + H\text{-}\overset{\overset{O}{||}}{C}\text{-}H \longrightarrow CH_3\text{-}CH_2\text{-}\overset{\overset{OMgBr}{|}}{\underset{\underset{H}{|}}{C}}\text{-}H$

$CH_3\text{-}CH_2\text{-}\overset{\overset{OMgBr}{|}}{\underset{\underset{H}{|}}{C}}\text{-}H \xrightarrow{H_2O} CH_3\text{-}CH_2\text{-}\overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}}\text{-}H + Mg(OH)Br$

-Propanol

(ii).. CO_2

$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + O{=}C{=}O \xrightarrow{ether} CH_3\text{-}CH_2\text{-}\overset{\overset{OMgBr}{|}}{C}{=}O \xrightarrow{H_3O^-} CH_3\text{-}CH_2\text{-}\overset{\overset{OH}{|}}{C}{=}O + Mg(Br)(OH)$

Carbon dioxide — Propanoic acid

44. What is Grignard's reagents? How Is it prepared? (2 times)

Ans: R-Mg-Xare known as Grignard reagents. These are derivatives of alkyl halides belonging to class of organo-metallic compounds. Grignard reagent was first prepared by Victor Grignard in 1900.

Grignard reagent is so important in organic synthesis that almost all the classes of organic compounds can be prepared from them. Due to their importance and applications Victor Grignard was awarded Nobel prize in chemistry.

Preparation of Grignard's reagents: Grignard's reagents are prepared by the reaction of magnesium metal with alkyl halides in the presence of dry ether as:

$$R\text{-}X + Mg \xrightarrow{Ether} R\text{-}Mg\text{-}X$$

$$CH_3\text{-}CH_2\text{-}Br + Mg \xrightarrow{Ether} CH_3\text{-}CH_2\text{-}Mg\text{-}Br$$

Ethyl magnesium bromide

45. How will you prepare 1-butanol using ethyl magnesium bromide? (4 times)

Ans: **<u>Preparation of 1-butanol by ethyl magnesium bromide:-</u>**

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + \underset{\text{O}}{CH_2\text{-}CH_2} \xrightarrow{Ether} CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OMg\text{-}Br$$

Ethylene epoxide

$$CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OMg\text{-}Br \xrightarrow{H_3O^+} CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OH + HO\text{-}Mg\text{-}Br$$

1-Butanol

46. How does $CH_3 - CH_2 - Mg - Br$ react with Ethylene Epoxide? (2 times)

Ans: **<u>Reaction of $CH_3 - CH_2 - Mg - Br$ with Ethylene Epoxide:</u>**

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + \underset{\text{O}}{CH_2\text{-}CH_2} \xrightarrow{Ether} CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OMg\text{-}Br$$

Ethylene epoxide

$$CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OMg\text{-}Br \xrightarrow{H_3O^+} CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OH + HO\text{-}Mg\text{-}Br$$

1-Butanol

47. The nature of alkyl group changes when alkyl halide is converted to Grignard's reagent, explain.

Ans: Grignard reagents are prepared by the reaction of magnesium metal with alkyl halides in the presence of dry ether (alcohol free, moisture free).

$$R - X + Mg \xrightarrow{Ether} R - Mg - X$$

$$CH_3 - CH_2 - Br + Mg \xrightarrow{Ether} CH_3 - CH_2 - Mg - Br$$

Ethyl magnesium bromide

Magnesium is more electronegative than carbon and C-Mg bond though covalent is tightly polar, giving alkyl carbon the partial negative charge. So Grignard reagent is more reactive than respective alkyl halide.

48. Give reaction of Grignard's reagent with CO_2 followed by hydrolysis in acid medium.

Ans: **<u>Reaction of Grignard's reagent with CO_2:</u>**

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + O{=}C{=}O \xrightarrow{ether} CH_3\text{-}CH_2\text{-}\underset{}{\overset{O\text{-}MgBr}{C}}{=}O \xrightarrow{H_3O^+} CH_3\text{-}CH_2\text{-}\overset{OH}{C}{=}O + Mg(Br)(OH)$$

Carbon dioxide Propanoic acid

49. Give chemical reactions by which acetone can be converted to 2-methyl 2-propanol by using Grignard's reagent?

Ans: **<u>Conversion of acetone into 2-methyl 2-propanol:-</u>**

$$CH_3\text{-}Mg\text{-}Br + CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}CH_3 \longrightarrow CH_3\text{-}\overset{OH}{\underset{CH_3}{C}}\text{-}CH_3$$

(2-methyl-2-propanol)

50. How primary Alcohols are produced by Grignard reagent? Write two methods.

Ans: (i).

$$CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OMgBr}{C}}\text{-}H \xrightarrow{H_3O^+} CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OH}{C}}\text{-}H + Mg(OH)Br$$

(ii).

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + \underset{\text{Ethylene epoxide}}{CH_2\text{-}CH_2\text{(O)}} \xrightarrow{Ether} CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OMg\text{-}Br$$

$$CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OMg\text{-}Br \xrightarrow{H_3O^+} \underset{\text{1-Butanol}}{CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2OH} + HO\text{-}Mg\text{-}Br$$

51. Prepare each of the following compound form ethyl magnesium bromide:
(a) propanoic acid. (b) 1 – propanol.

Ans: (a):

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + O{=}C{=}O \xrightarrow{ether} CH_3\text{-}CH_2\text{-}\overset{OMgBr}{C}{=}O \xrightarrow{H_3O^+} CH_3\text{-}CH_2\text{-}\overset{OH}{C}{=}O + Mg(Br)(OH)$$

propanoic acid

(b):

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + H\text{-}\overset{O}{\overset{||}{C}}\text{-}H \longrightarrow CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OMgBr}{C}}\text{-}H$$

$$CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OMgBr}{C}}\text{-}H \xrightarrow{H_3O^+} CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OH}{C}}\text{-}H + Mg(OH)Br$$

1 – propanol

52. Prepare 2-Butanol from acetaldehyde in the presence of base?

Ans: <u>**Preparation of 2-Butanol from acetaldehyde:-**</u>

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}H + CH_3\text{-}CH_2\text{-}Mg\text{-}Br \longrightarrow CH_3\text{-}CH_2\text{-}\underset{CH_3}{\overset{H}{C}}\text{-}OMgBr \xrightarrow{H_2O} CH_3\text{-}CH_2\text{-}\underset{CH_3}{\overset{H}{C}}\text{-}OH + Mg(OH)Br$$

2-Butanol

53. How would you convert Acetone into t-butyl alcohol? (3 times)

Ans: <u>**Conversion of acetone into t-butyl alcohol:-**</u>

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 + CH_3\text{-}Mg\text{-}Br \longrightarrow CH_3\text{-}\underset{CH_3}{\overset{CH_3}{C}}\text{-}OMgBr \xrightarrow{H_2O} CH_3\text{-}\underset{CH_3}{\overset{CH_3}{C}}\text{-}OH + Mg(OH)Br$$

54. Show the mechanism for the reaction of acetone with Grignard's reagent?

Ans: <u>**Reaction of acetone with Grignard's reagent:-**</u>

$$CH_3\text{-}Mg\text{-}Br + CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 \longrightarrow CH_3\text{-}\underset{CH_3}{\overset{OH}{C}}\text{-}CH_3$$ (2-methyl-2-propanol)

55. Apply your knowledge to convert formaldehyde into ethyl alcohol?

Ans: <u>**Conversion of formaldehyde into ethyl alcohol:-**</u>

$$\underset{\text{Formaldehyde}}{HCHO} + CH_3MgBr \longrightarrow CH_3CH_2OMgBr \xrightarrow{H_3O^+} \underset{\text{Ethyl alcohol}}{CH_3CH_2OH}$$

2018

56. Write down a method for the preparation of ethyl magnesium bromide in the laboratory?

Ans: **Preparation of ethyl magnesium bromide:**

Preparation of Grignard's reagents: Grignard's reagents are prepared by the reaction of magnesium metal with alkyl halides in the presence of dry ether as:

$$R\text{-}X + Mg \xrightarrow{Ether} R\text{-}Mg\text{-}X$$

$$CH_3\text{-}CH_2\text{-}Br + Mg \xrightarrow{Ether} \underset{\text{Ethyl magnesium bromide}}{CH_3\text{-}CH_2\text{-}Mg\text{-}Br}$$

57. **How is Grignard reagent converted into 1-propanol?**

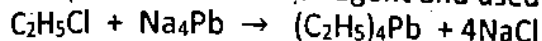
Ans: **Conversion of Grignard Reagent:**

$$CH_3\text{-}CH_2\text{-}Mg\text{-}Br + H\text{-}\overset{\overset{O}{\|}}{C}\text{-}H \longrightarrow CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OMgBr}{|}}{C}\text{-}H$$

$$CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OMgBr}{|}}{C}\text{-}H \xrightarrow{H_2O} \underset{\text{1 – propanol}}{CH_3\text{-}CH_2\text{-}\underset{H}{\overset{OH}{|}}{C}\text{-}H} + Mg\begin{matrix} OH \\ Br \end{matrix}$$

58. **Convert C_2H_5Cl to T.E.L.**

Ans: Ethyl chloride react with sodium lead alloy giving tetraethyl lead. This compound is important anti-knock agent and used in gasoline.

$C_2H_5Cl + Na_4Pb \rightarrow (C_2H_5)_4Pb + 4NaCl$

2019

59. **Define Alkyl halides. Give one example of primary alkyl halides.**

Ans: "Monohaloalkanes are called alkyl halides."

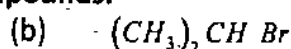
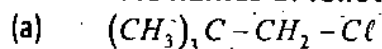
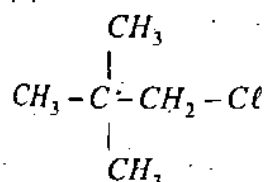
Their general formula is $R-X$.

CH_3-Br, $CH_3-CH_2-C\ell$ are primary alkyl halides

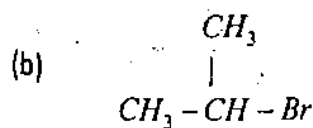
60. **Give IUPAC names of following compounds.**

(a) $(CH_3)_3C-CH_2-C\ell$ (b) $(CH_3)_2CH\ Br$

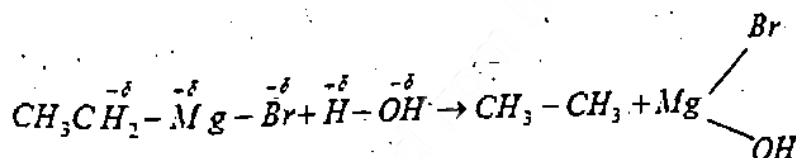
Ans: (a)

$$CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_2-C\ell$$

1 – chloro – 2, 2 dimethylpropane

(b)

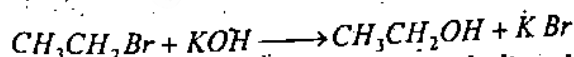
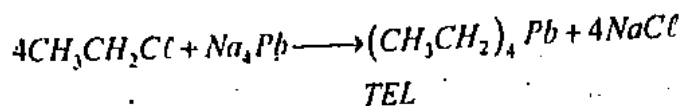
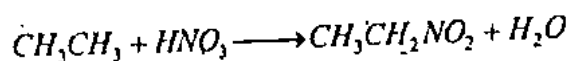
$$CH_3-\overset{CH_3}{\overset{|}{CH}}-Br$$

2 – bromopropane

61. **Write reaction of Grignard reagent with water.**

$$CH_3C\overset{-\delta}{H_2}-\overset{+\delta}{M}g-\overset{-\delta}{Br}+\overset{+\delta}{H}-\overset{-\delta}{OH} \rightarrow CH_3-CH_3+Mg\begin{matrix} Br \\ OH \end{matrix}$$

62. **What is a Nucleophilic substitution reaction. Give example.**

Ans: Those reactions in which halogen of Alkyl halide is replaced by other nucleophile (e.g; $\bar{O}H$, $\bar{N}H_2$ etc) is called Nucleophilic substitution reaction.

Example:

$$CH_3CH_2Br + KOH \longrightarrow CH_3CH_2OH + KBr$$

63. **Write reaction to propane tetraethyl lead and nitroethane**

$$4CH_3CH_2Cl + Na_4Pb \longrightarrow (CH_3CH_2)_4Pb + 4NaCl$$
TEL

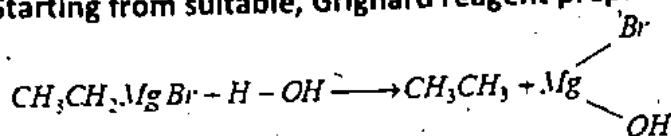
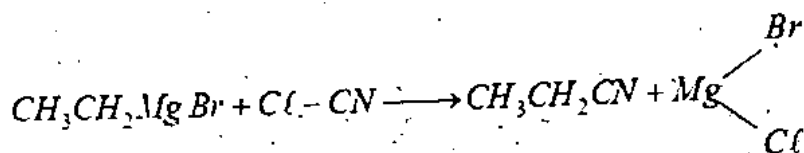
Ans:

$$CH_3CH_3 + HNO_3 \longrightarrow CH_3CH_2NO_2 + H_2O$$
Nitroethane

64. Starting from suitable, Grignard reagent prepare ethane and ethyl cyanide.

$$CH_3CH_2MgBr - H - OH \longrightarrow CH_3CH_3 + Mg(Br)(OH)$$

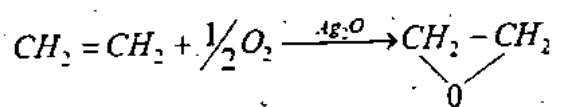
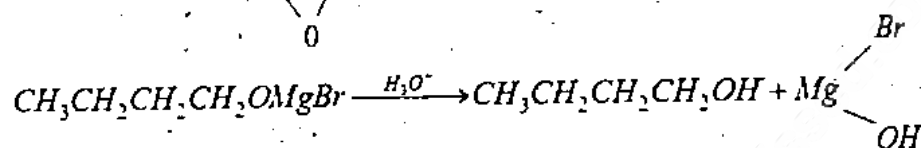
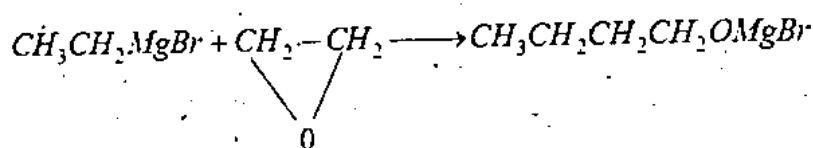
Ans:

$$CH_3CH_2MgBr + Cl - CN \longrightarrow CH_3CH_2CN + Mg(Br)(Cl)$$

65. How ethene is converted to 1 – butanol

Ans:

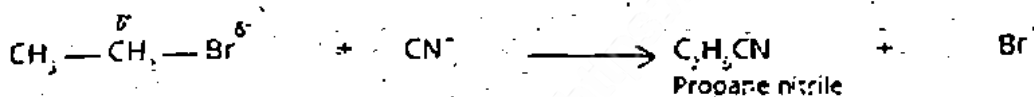
$$CH_2 = CH_2 + \tfrac{1}{2}O_2 \xrightarrow{Ag_2O} CH_2 - CH_2 \text{ (bridged by O)}$$
Ethylene epoxide

$$CH_3CH_2MgBr + CH_2 - CH_2 \text{ (bridged by O)} \longrightarrow CH_3CH_2CH_2CH_2OMgBr$$

$$CH_3CH_2CH_2CH_2OMgBr \xrightarrow{H_3O^+} CH_3CH_2CH_2CH_2OH + Mg(Br)(OH)$$

2021

66. How would you prepare the following compounds from ethyl bromide?
(a) Ethyl alcohol **(b) Ethyl Cyanide**

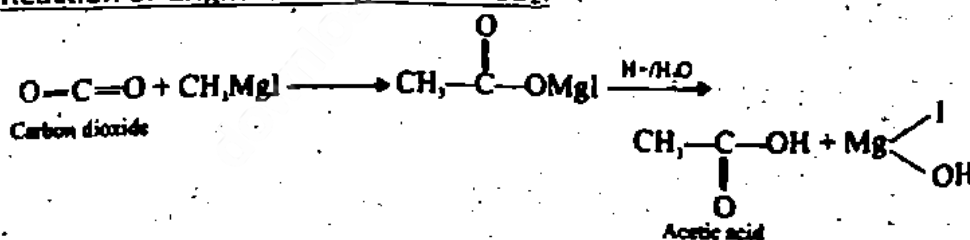
Ans: (a) Ethyl alcohol

(b) Ethyl Cyanide

$$CH_3 - \overset{\delta^+}{CH_2} - \overset{\delta^-}{Br} + CN^- \longrightarrow C_2H_5CN + Br^-$$
Propane nitrile

$$CH_3 - \overset{\delta^+}{CH_2} - \overset{\delta^-}{Br} + \overline{O}H \longrightarrow C_2H_5OH + Br^-$$
Ethyl alcohol

67. How acetic acid is prepared from Grignard's reagent?

Ans: **<u>Reaction of Grignard's reagent with CO_2:</u>**

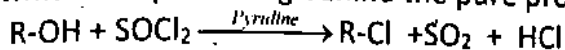
$$O{=}C{=}O + CH_3MgI \longrightarrow CH_3-\overset{O}{\overset{\|}{C}}-OMgI \xrightarrow{H-OH} CH_3-\underset{O}{\underset{\|}{C}}-OH + Mg(I)(OH)$$
Carbon dioxide — Acetic acid

68. Define Alkyl Halide. Which is the best method of preparing alkyl halides?

Ans: **Def:** Alkyl halides are derivatives of alkanes, obtained by replacing one hydrogen atom of alkane with a halogen atom.

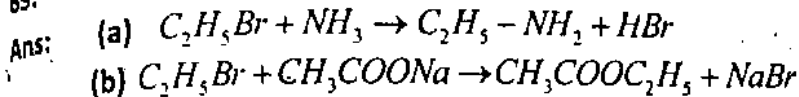
Best method of preparation:

Preparation of alkyl chloride from alcohols:

Alcohols react with thionyl chloride in pyridine as a solvent to give alkyl chlorides. This method is especially useful since the by-products (HCl, SO_2) are gases, which escape leaving behind the pure product.

$$R\text{-}OH + SOCl_2 \xrightarrow{Pyridine} R\text{-}Cl + SO_2 + HCl$$

69. Complete the reactions: (a) $C_2H_5Br + NH_3 \rightarrow$ (b) $C_2H_5Br + CH_3COONa \rightarrow$

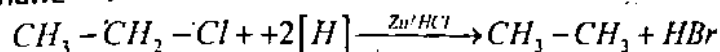
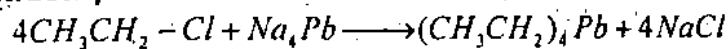
Ans: (a) $C_2H_5Br + NH_3 \rightarrow C_2H_5 - NH_2 + HBr$

(b) $C_2H_5Br + CH_3COONa \rightarrow CH_3COOC_2H_5 + NaBr$

70. Convert ethyl chloride into (a) Ethane (b) Tetraethyl Lead

Ans: **(a) Ethane :**

$$CH_3 - CH_2 - Cl + +2[H] \xrightarrow{Zn/HCl} CH_3 - CH_3 + HBr$$

(b) Tetraethyl Lead

$$4CH_3CH_2 - Cl + Na_4Pb \longrightarrow (CH_3CH_2)_4Pb + 4NaCl$$

Tetra ethyl Lead

71. Write any four differences between E_1 and E_2 reactions.

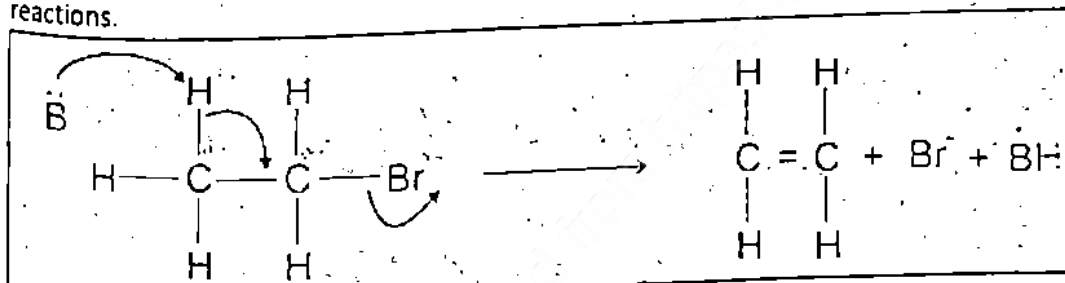
Ans:

E_2 reactions.	E_1 reactions.
i. E_2-reactions are bimolecular elimination reactions.	i. E_1 -reactions are unimolecular elimination reaction.
ii. These are completed in a single step.	ii. These are completed in a two or more steps.
iii. Reactions of primary alkyl halides are generally E_2-reactions.	iii. Reactions of tertiary alkyl halides are generally E_1-reactions.
iv. The molecularity of E_2-reactions is two and these reactions show second order kinetics.	iv. The molecularity of E_1-reactions is one and these reactions show first order kinetics.

72. What is β-Elimination reaction? Give an example of, $\beta - E2$ elimination reaction.

Ans: **Def:** The reactions of alkyl halides in which one hydrogen atom from β-carbon atom and a halogen atom from α-carbon atom are eliminated, are called β-elimination reactions.

$$\ddot{B} + H_3C - CH_2 - Br \longrightarrow H_2C = CH_2 + Br^- + BH^+$$

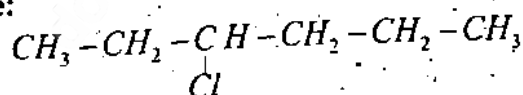
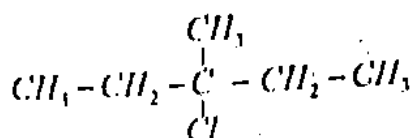
(Structures drawn: H–C(H)(H)–C(H)(H)–Br with base $\ddot{B}$ attacking the β-H; product CH₂=CH₂ shown with all H atoms.)

73. Draw structure of primary, secondary and tertiary alkyl halide from the given compound $C_6H_{13}Cl$.

Ans: **Primary alkyl halide:** $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - Cl$

Secondary alkyl halide:

$$CH_3 - CH_2 - \underset{\displaystyle Cl}{\underset{|}{C}}H - CH_2 - CH_2 - CH_3$$

Tertiary alkyl halide:

$$CH_3-CH_2-\underset{Cl}{\overset{CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2-CH_3$$

74. Define nucleophilic substitution reactions. Name its two types.

Ans: Nucleophilic substitution reactions:

The reactions in which one nucleophile displaces another nucleophile, which is in combination of an electrophile are called Nucleophilic substitution Reactions.

These reactions are represented as S_N.Reactons.

It may be S_N2 & S_N1.

75. Give two properties of S_N1 reactions.

Ans: (i) The rate of S_N1 Reactiosn depends upon the conc. Of alkyl halides only. Mathematically,

Rate = K[alkyl halide]

(ii) Tertiary alkyl halides always follow S_N1 Mechanism.

CHAPTER NO:10 ALKYL HALIDES LONG QUESTIONS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 10.1

1. Define Alkyl Halide. Give three methods to prepare them from Alcohols. (3 times)

Ans: (Text Book Page No:197)

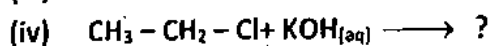
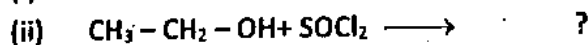
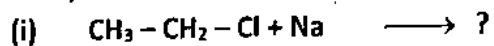
Topic No: 10.3

2. Complete the following chemical reactions.

(i) $CH_3-CH_2-Cl+Na \longrightarrow ?$

(ii) $CH_3-CH_2-OH+SOCl_2 \longrightarrow ?$

(iii) $CH_3-CH_2-Cl+Na_4Pb \longrightarrow ?$

(iv) $CH_3-CH_2-Cl+KOH_{(aq)} \longrightarrow ?$

Topic No: 10.4

3. Discuss reactivity of alkyl halides.

Ans: (Text Book Page No:197)

4. Discuss two main factors which govern reactivity of alkyl halides.

Ans: (Text Book Page No:197)

Topic No: 10.5.1

5. Write note on the following terms and give an example in each case. (3 times)

i) Nucleophile ii) Electrophile iii) Leaving group iv) Substrate

Ans: (Text Book Page No:199)

6. What are SN-reactions? Explain SN[1] reaction in detail.

Ans: (Text Book Page No:200)

Topic No: 10.5.2

7. What are S_N reaction? Differentiate between S_N1 and S_N2 reaction? (8 times)

Ans: (Text Book Page No:198)

8. Discuss S_N2 reactions of alkyl halides in detail. (9 times)

Ans: (Text Book Page No:200)

9. Write a note on S_N1 reactions.

Ans: (Text Book Page No:200)

10. Define Nucleophilic substitution reactions and discuss the mechanism of S_N1 reaction. (7 times)
Ans: (Text Book Page No:198+200)
11 What are S_N reactions & Explain S_N1 reactions with help of suitable example.
Ans: (Text Book Page No:200)

Topic No: 10.5.3

12. Write a note on β-elimination reactions. (2 times)
Ans: (Text Book Page No:202)
13. Using ethyl bromide as a starting material how would you prepare :
n-Butane b) Ethene
Ans: (Text Book Page No:204)
14. Using ethyl bromine how would you prepare (2 times)
N-butane ii) Etheneiii) Ethyl Alcohol iv) Propanic acid
Ans: (Text Book Page No:204)
15. Discuss briefly the two possible mechanisms of β-elimination reactions.
Ans: (Text Book Page No:202)
16. Define elimination reactions and discuss the mechanism of E_2 reactions. (5 times)
Ans: (Text Book Page No:202)
17. Compare E2 and E1 mechanism for the β-Elimination reactions? (2 times)
Ans: (Text Book Page No:202)
18. Write down reaction of CH_3-CH_2-Cl with (i) Na (ii) Zn + HCl (iii) Na_4Pb(iv) Mg
Ans: (Text Book Page No:204)

Topic No: 10.6

19. Write the reactions of the Grignard reagent with the following: (5 times)
Water ii) Ammonia iii) CO_2 iv) Alcohol
Ans: (Text Book Page No:205+206)
20. How would Grignard reagent reacts with the following:
i) Acetaldehyde 0 ii) Acetone iii) Cyanogen Chloride iv) Alcohols
Ans: (Text Book Page No:205+206)
21. What products are formed when the following compounds are treated with ethyl magnesium bromide followed by hydrolysis in the presence of an acid: (3 times)
i) HCHO, ii) CH_3CHOiii) $(CH_3)_2CO$ iv) ClCN
Ans: (Text Book Page No:205+206)
22. Give reactions of ethyl magnesium bromide with (i) HCHO (ii) CH_3CHO (iii) $(CH_3)_2CO$ (iv) Cl (2 times)
Ans: (Text Book Page No:206)
23. Give reaction of Grignard's reagent with (i) Alcohol (ii) CO_2 (iii) Acetaldehyde.
Ans: (Text Book Page No:205)
24. What products are formed when the following compounds are treated with ethyl magnesium bromide, followed by hydrolysis in the presence of an acid?
(i) Fromaldehyde (ii) CO_2 (iii) Acetaldehyde (iV0Ethyl alcohol
Ans: (Text Book Page No:205)

2018

25. How will you make the following conversions:
(i) Acetic acid into propanoic acid (ii) Acetone into teriary butyl alcohol

2021

26. What is β-Elimination reaction? Differentiate between E_1 and E_2 elimination reactions.
27. How does ethanol react with
(i) Na (ii) PCl_5 (iii) CH_3MgI (iv) $SOCl_2$
28. What are Nucleophilic substitution reactions? Explain S_N2 mechanism.
29. What is β – Elimination Reaction? Explain E_1 reaction in detail.
30. Write note on the following (i) Classification of Alkyl halides (ii) Wurtz Synthesis.

CHAPTER NO:11 OBJECTIVES (MCQ'S) ALCOHOLS, PHENOLS AND ETHERS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 11.1

1. Which compound is called universal solvent? **(8 times)**
(a) H_2O (b) CH_3OH (c) C_2H_5OH (d) CH_3-O-CH_3

Topic No: 11.2

2. ________ is alcohol in the following: **(3 times)**
(a) CH_3CH_2OH (b) CH_3OCH_3 (c) CH_3COOH (d) CH_3CHO

Topic No: 11.2.2

3. Alcohol obtained by fermentation is only upto:
(a) 10% (b) 12% (c) 20% (d) 95%

4. Rectified spirit contains alcohol (ethanol) about: **(5 times)**
(a) 80% (b) 85% (c) 90% (d) 95%

5. Which enzyme is not used in fermentation of starch? **(7 times)**
(a) Urease (b) Diastase (c) Zymase (d) Invertase

6. Methyl alcohol is not used : **(3 times)**
(a) As a solvent (b) As a antifreezing agent
(c) As a substitute for petrol (d) For denaturing of ethyl alcohol

Topic No: 11.2.3

7. The compound which is more soluble in water: **(6 times)**
(a) C_6H_5OH (b) C_2H_5OH (c) $C_6H_{13}OH$ (d) $C_7H_{15}OH$

8. Which compound shows hydrogen bonding? **(4 Times)**
(a) C_2H_6 (b) C_2H_5COOH (c) C_2HO_5H (d) C_2H_5OH

9. ________ compound shows extensive Hydrogen Bonding with water:
(a) C_2H_6 (b) H_2S (c) CH_3Cl (d) C_2H_5OH

Topic No: 11.2.4

10. In t-butyl alcohol, the tertiary carbon is bonded to: **(7 times)**
(a) Three hydrogen atoms (b) Two hydrogen atoms
(c) One hydrogen atom (d) No hydrogen atom

11. Ethanol can be converted into ethanoic acid by: **(10 times)**
(a) Oxidation (b) Fermentation (c) Hydrogenation (d) Hydration

Topic No: 11.2.7

12. Isopropyl alcohol on oxidation gives:
(a) acetaldehyde (b) acetone (c) ether (d) propene

Topic No: 11.5

13. Carbolic acid is:
(a) Phenol (b) Methanol (c) Carbonic acid (d) Chloroform

Topic No: 11.5.6

14. Phenol can be identified by the test:
(a) Bromine water (b) Chlorine water (c) Lucas test (d) Bayers test

Topic No: 11.6.3

15. According to Lewis concept, ethers behave as: **(4 times)**
(a) Acid (b) Base (c) Solvent (d) Nucleophile

16. Which of the following shows maximum hydrogen bonding with water? **(9 times)**
(a) CH_3OH (b) C_2H_5OH (c) CH_3-O-CH_3 (d) C_6H_5OH

17. Which of the following is weakest acid?
(a) Phenol (b) Benzoic acid (c) Ethyl alcohol (d) Water

18. Which compound causes maximum repulsion with water? **(7 times)**
(a) C_2H_5OH (b) C_6H_6 (c) CH_3-O-CH_3 (d) $CH_3-CH_2-CH_2-OH$

19. Which of the following will have highest boiling point? **(4 times)**
(a) methanol (b) ethanol (c) propanol (d) 2-hexanone

2018

20. Alcohol obtained by fermentation process never exceed beyond:
(a) 14% (b) 10% (c) 16% (d) 95%

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

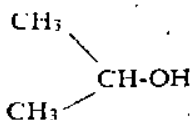
1	2	3	4	5	6	7	8	9	10	11
A	A	B	D	A	C	B	D	D	D	A
12	13	14	15	16	17	18	19	20		
B	A	A	B	B	C	B	D	A		

CHAPTER NO:11 SHORT QUESTIONS ALCOHOLS, PHENOLS AND ETHERS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 11.2

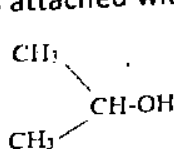
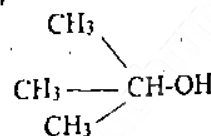
1 Differentiate between primary and secondary alcohol?

Ans: Monohydric alcohols are further classified into primary, secondary and tertiary alcohols. In primary alcohols –OH group is attached with primary carbon atom, in secondary alcohols –OH group is attached with secondary carbon atom. For example

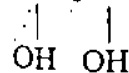
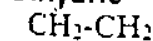
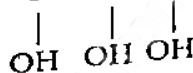
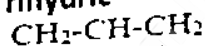
CH_3-CH_2-OH
Primary alcohol

$(CH_3)_2$CH-OH
Secondary alcohol

2 Classify alcohols giving an example for each?

Ans: Alcohols are classified into monohydric and polyhydric alcohols. Monohydric alcohols contain one –OH group while polyhydric alcohols contain two, three or more –OH groups and named as dihydric or trihydric etc.
Monohydric alcohols are further classified into primary, secondary and tertiary alcohols. In primary alcohols –OH group is attached with primary carbon atom, in secondary alcohols –OH group is attached with secondary carbon atom and in tertiary alcohols –OH group is attached with tertiary carbon atom. For example

CH_3-CH_2-OH
Primary alcohol

Secondary alcohol

Tertiary alcohol

3 Define and give examples of each of Dihydric and Trihydric Alcohols?(3 times)

Ans: Alcohols are classified into monohydric and polyhydric alcohols. Monohydric alcohols contain one –OH group while polyhydric alcohols contain two, three or more –OH groups and named as dihydric or trihydric etc. For example:

Dihydric
$CH_2(OH)$-$CH_2(OH)$
1,2Ethanediol

Trihydric
$CH_2(OH)$-$CH(OH)$-$CH_2(OH)$
1,2,3-propanetriol

4 Why ethyl alcohol is liquid while Ethyl chloride is gas at room temperature? (4 times)

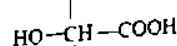
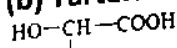
Ans: Ethyl alcohol is liquid while ethyl chloride is gas because ethyl alcohol has hydrogen bonding which is present in it but absent in ethyl chloride.

5 Write the structure of compounds: (a) 2-Buten-l-oℓ (b) Tartaric acid

Ans:
(a) 2-Buten-l-oℓ

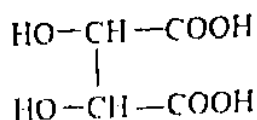
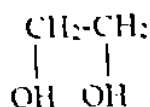
CH_3- CH = CH - CH_2- OH

(b) Tartaric acid

HO–CH–COOH
|
HO–CH–COOH

Topic No: 11.2.1

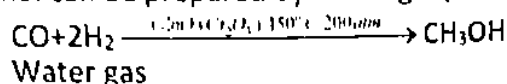
6 Give structural formula of 1,2-ehanediol and tartaric acid.

Ans: 1,2-ehanediol **tartaric acid**

```
CH2-CH2          HO—CH—COOH
 |    |              |
 OH   OH         HO—CH—COOH
```

Topic No: 11.2.2

7 Give preparation of methanol by reaction of CO and H_2?

Ans: Methanol can be prepared by water gas($CO+H_2$) as:

$$\underset{\text{Water gas}}{CO+2H_2} \xrightarrow{ZnO+Cr_2O_3,\ 450°C,\ 200atm} CH_3OH$$

First of all mixture of carbon monoxide and hydrogen is purified. It is compressed under a pressure of 200 atmospheres and taken into a reaction chamber by means of coiled pipes. Here the catalyst is heated upto 450-500ºC. Gases react to form methanol vapours. These vapours are passed through a condenser to get methanol. Unreacted gases are recycled though compressor to reaction chamber.

8 How is methylated spirit prepared?

Ans: Ethanol is denatured by addition of 10% methanol to avoid its use for drinking purposes. Such alcohol is called methylated spirit. A small quantity of pyridine or acetone may also be added for this purpose.

9 Only 12-14% ethanol can be prepared by fermentation process.Justify?

Ans: Alcohol obtained by fermentation is only upto12% and never exceeds 14% because beyond this limit enzymes become inactive. This alcohol is distilled again and again to obtain 95% alcohol which is called rectified spirit.

10 Write the equations involved in preparation of ethyl alcohol from molasses?

Ans: The residue obtained after the crystallization of sugar from concentrated sugar cane juice is called molasses. It undergoes fermentation in the presence of enzymes present in yeast to give ethanol.

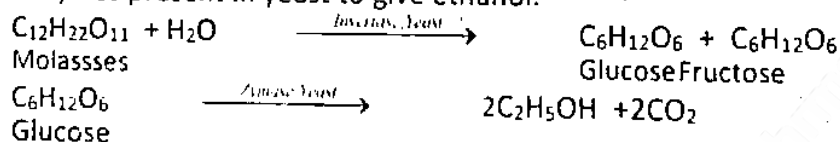
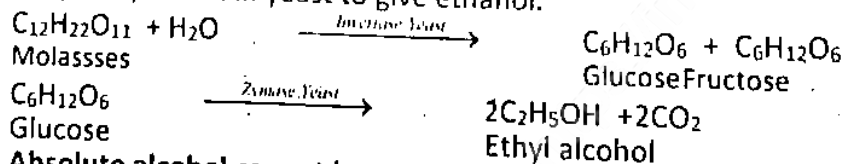
$$\underset{\text{Molassses}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Invertase, Yeast}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow{\text{Zymase Yeast}} 2C_2H_5OH + 2CO_2$$

11 How ethanol is prepared from Molasses?

Ans: The residue obtained after the crystallization of sugar from concentrated sugar cane juice is called molasses. It undergoes fermentation in the presence of enzymes present in yeast to give ethanol.

$$\underset{\text{Molassses}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{Invertase Yeast}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow{\text{Zymase Yeast}} \underset{\text{Ethyl alcohol}}{2C_2H_5OH} + 2CO_2$$

12 Absolute alcohol cannot be prepared by fermentation process. Why? **(7 times)**

Ans: Absolute alcohol cannot be prepared by fermentation process because there if moisture in the process. Absolute alcohol can be prepared by the rectified spirit in the presence of CaO which absorb its moisture.

13 Define fermentation. Give one example? **(2 times)**

Ans: **Fermentation:-**Fermentation is a biochemical process which occurs in presence of certain enzymes secreted by microorganisms such as yeast. Optimum temperature for this process of fermentation is 25-35ºC. Proper aeration, dilution of solution and the absence of any preservative are essential conditions for fermentation.

14 Explain denaturing of alcohol? **(7 times)**

Ans: Ethanol is denatured by addition of 10% methanol to avoid its use for drinking purposes. Such alcohol is called methylated spirit. A small quantity of pyridine or acetone may also be added for this purpose.

15 **How ethanol is prepared on industrial scale in the world?**

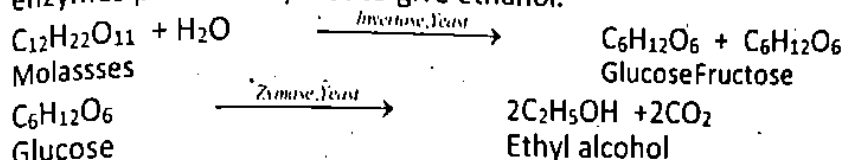
Ans: Ethanol is prepared on industrial scale world over by the process of fermentation. Fermentation is a biochemical process which occurs in the presence of certain enzymes secreted by microorganisms such as yeast. Optimum temperature for this process of fermentation is 25-35ºC. Proper aeration, dilution of solution and the absence of any preservative are essential conditions for fermentation.

The residue obtained after the crystallization of sugar from concentrated sugar cane juice is called molasses. It undergoes fermentation in the presence of enzymes present in yeast to give ethanol.

$C_{12}H_{22}O_{11} + H_2O \xrightarrow{Invertase, Yeast} C_6H_{12}O_6 + C_6H_{12}O_6$

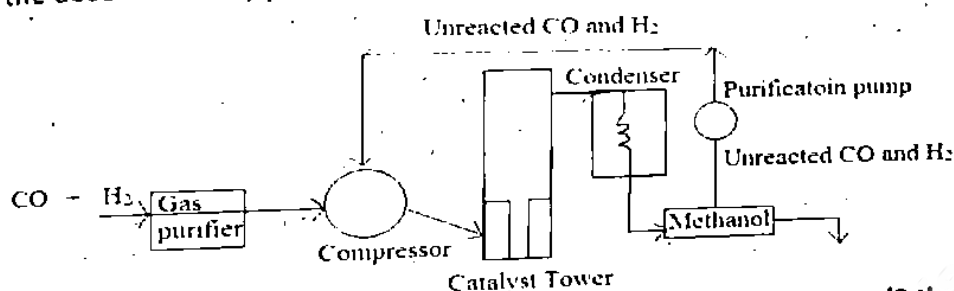
Molassses — GlucoseFructose

$C_6H_{12}O_6 \xrightarrow{Zymase, Yeast} 2C_2H_5OH + 2CO_2$

Glucose — Ethyl alcohol

16. **Draw flow sheet diagram for manufacture of methanol.**

Ans: **Flow sheet diagram for manufacture of methanol:**

17 **What are the essential conditions for fermentations?**

Ans: Fermentation is a biochemical process which occurs in presence of certain enzymes secreted by microorganisms such as yeast. Optimum temperature for this process of fermentation is 25-35ºC. Proper aeration, dilution of solution and the absence of any preservative are essential conditions for fermentation.

18 **Define fermentation? What are its conditions?** **(2 times)**

Ans: **Fermentation:** Fermentation is a biochemical process which occurs in presence of certain enzymes secreted by microorganisms such as yeast. Optimum temperature for this process of fermentation is 25-35ºC. Proper aeration, dilution of solution and the absence of any preservative are essential conditions for fermentation.

19 **How is alcohol denaturned to make it unfit for drinking?**

Ans: Ethanol is denatured by addition of 10% methanol to avoid its use for drinking purposes. Such alcohol is called methylated spirit. A small quantity of pyridine or acetone may also be added for this purpose.

Topic No: 11.2.3

20. **Water has higher boiling point than ethanol. Explain.** **(2 times)**

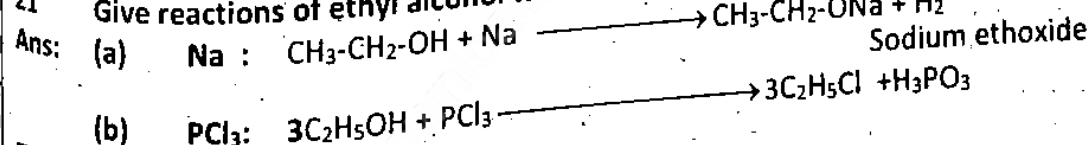
Ans: Water has higher boiling point than ethanol because of more and stronger hydrogen bonding in water than ethanol.

Topic No: 11.2.6

21 **Give reactions of ethyl alcohol with: (a) Na (b) PCl_3**

Ans: (a) Na : $CH_3\text{-}CH_2\text{-}OH + Na \longrightarrow CH_3\text{-}CH_2\text{-}ONa + H_2$

Sodium ethoxide

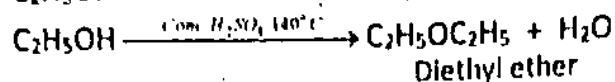
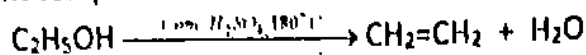
(b) PCl_3: $3C_2H_5OH + PCl_3 \longrightarrow 3C_2H_5Cl + H_3PO_3$

Topic No: 11.2.7

22 **How does ethyl alcohol react with the following reagents?**

i)Conc.H_2SO_4 **ii)PCl_5**

Ans: **I)Conc.H_2SO_4:** Alcohol reacts with conc. H_2SO_4 and give different products at different temperatures.

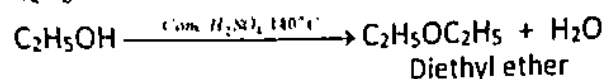
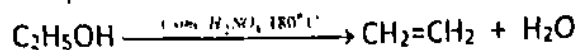
$$C_2H_5OH \xrightarrow{Conc.\ H_2SO_4,\ 180^\circ C} CH_2{=}CH_2 + H_2O$$

$$C_2H_5OH \xrightarrow{Conc.\ H_2SO_4,\ 140^\circ C} \underset{\text{Diethyl ether}}{C_2H_5OC_2H_5} + H_2O$$

II)PCl_5: $C_2H_5OH + PCl_5 \longrightarrow C_2H_5Cl + POCl_3 + HCl$

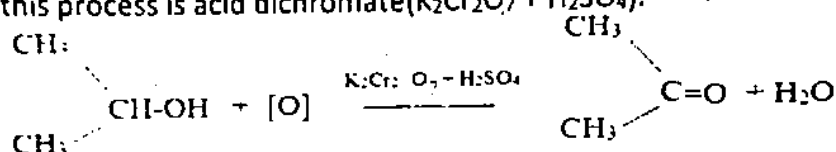
23 **Alcohol react with conc.H_2SO_4 and give, different products at different conditions. Give reactions?** **(4 times 2018)**

Ans: Alcohol reacts with conc. H_2SO_4 and give different products at different temperatures.

$$C_2H_5OH \xrightarrow{Conc.\ H_2SO_4,\ 180^\circ C} CH_2{=}CH_2 + H_2O$$

$$C_2H_5OH \xrightarrow{Conc.\ H_2SO_4,\ 140^\circ C} \underset{\text{Diethyl ether}}{C_2H_5OC_2H_5} + H_2O$$

24 **Convert 2-Propanol into acetone.?**

Ans: 2-Propanol is converted into acetone by oxidation reaction. Oxidizing agents in this process is acid dichromate($K_2Cr_2O_7 + H_2SO_4$).

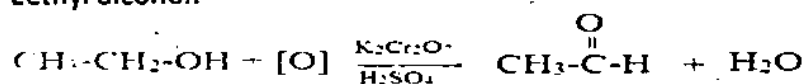
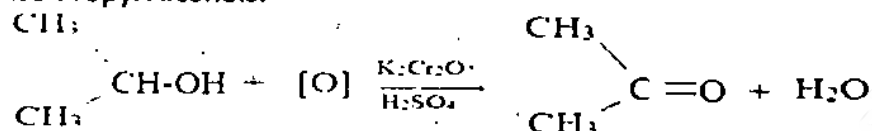
$$(CH_3)_2CH\text{-}OH + [O] \xrightarrow{K_2Cr_2O_7 - H_2SO_4} (CH_3)_2C{=}O + H_2O$$

25. **How Ethyl Alcohol and Iso-Propyl Alcohols are oxidized?**

Ans: Oxidation of alcohols convert them into aldehydes and ketones. The best reagent for these purpose is acid dichromate.

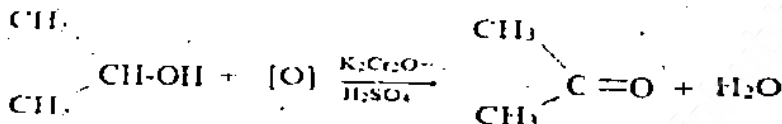
Eethyl alcohol:

$$CH_3\text{-}CH_2\text{-}OH + [O] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}H + H_2O$$

Iso-Propyl Alcohols:

$$(CH_3)_2CH\text{-}OH + [O] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} (CH_3)_2C{=}O + H_2O$$

26 **How will you convert propanol into propanone?**

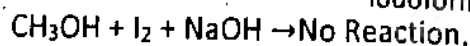
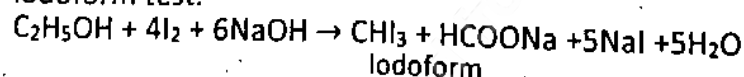
Ans:

$$(CH_3)_2CH\text{-}OH + [O] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} (CH_3)_2C{=}O + H_2O$$

Topic No: 11.3

27 **How will you distinguish between methanol & ethanol? / How iodoform reaction helps to distinguish between Methanol and ethanol?** **(9 times)**

Ans: Ethanol gives iodoform with iodine in the presence of NaOH. Formation of yellow crystals indicate that the alcohol is ethanol. Methanol does not give iodoform test.

$$C_2H_5OH + 4I_2 + 6NaOH \rightarrow \underset{\text{Iodoform}}{CHI_3} + HCOONa + 5NaI + 5H_2O$$

$$CH_3OH + I_2 + NaOH \rightarrow \text{No Reaction.}$$

28 **Distinguish ethanol and tertiary butyl alcohol by Lucas test? (2 times)**

Ans: Primary, secondary and tertiary alcohols are identified and distinguished by reacting them with con. HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions:

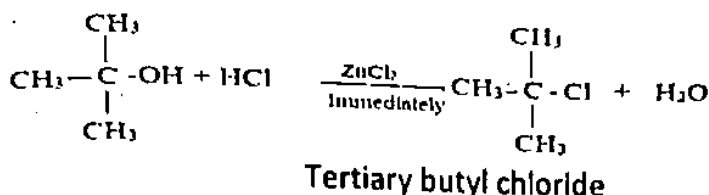
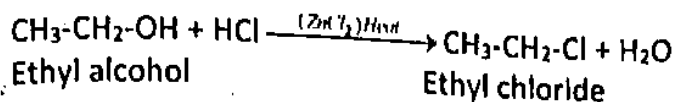
(i). Ethanol is a primary alcohol which forms an oily layer only on heating.

(ii). Tertiary butyl alcohol is a tertiary alcohol which forms an oily layer immediately.

$CH_3\text{-}CH_2\text{-}OH + HCl \xrightarrow{(ZnCl_2)Heat} CH_3\text{-}CH_2\text{-}Cl + H_2O$

Ethyl alcohol — Ethyl chloride

$$(CH_3)_3C\text{-}OH + HCl \xrightarrow[Immediately]{ZnCl_2} (CH_3)_3C\text{-}Cl + H_2O$$

Tertiary butyl chloride

29 Write a note on Lucas Test? (3 times)

Ans: Primary, secondary and tertiary alcohols are identified and distinguished by reacting them with con. HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions:

(i).. Tertiary alcohols form an oily layer immediately.
(ii).. Secondary alcohols for an oily layer in five to ten minutes.
(iii). Primary alcohols form an oily layer only on heating.

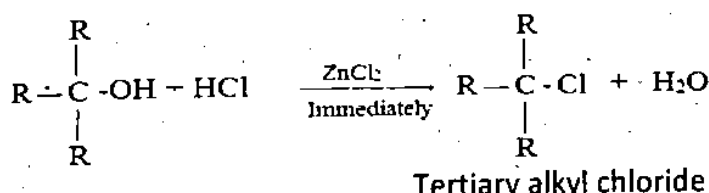
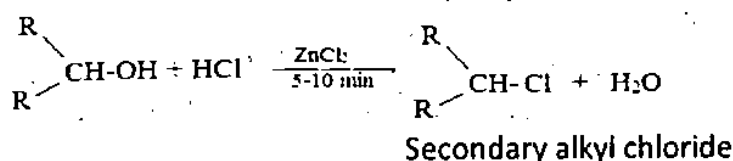
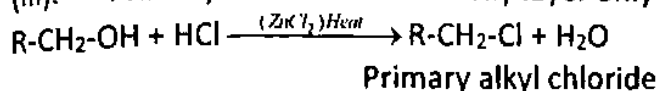
$R\text{-}CH_2\text{-}OH + HCl \xrightarrow{(ZnCl_2)Heat} R\text{-}CH_2\text{-}Cl + H_2O$

Primary alkyl chloride

$$R_2CH\text{-}OH + HCl \xrightarrow[5\text{-}10\ min]{ZnCl_2} R_2CH\text{-}Cl + H_2O$$

Secondary alkyl chloride

$$R_3C\text{-}OH + HCl \xrightarrow[Immediately]{ZnCl_2} R_3C\text{-}Cl + H_2O$$

Tertiary alkyl chloride

30 How will you distinguish between 1-propanol and 2-propanol? (3 times)

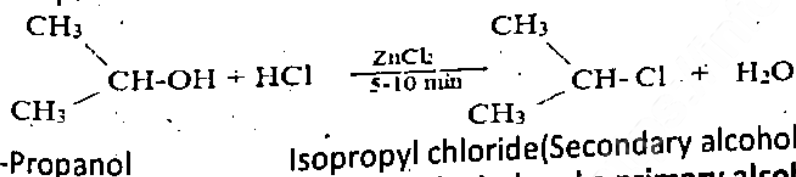
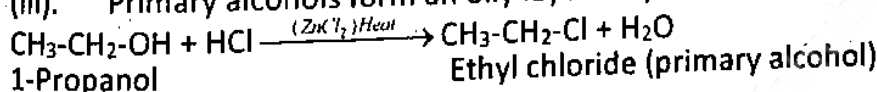
Ans: 1-propanol is a primary alcohol while 2-propanol is a secondary alcohol.
Primary, secondary and tertiary alcohols are identified and distinguished by reacting them with con. HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions:

(i).. Tertiary alcohols form an oily layer immediately.
(ii).. Secondary alcohols for an oily layer in five to ten minutes.
(iii). Primary alcohols form an oily layer only on heating.

$CH_3\text{-}CH_2\text{-}OH + HCl \xrightarrow{(ZnCl_2)Heat} CH_3\text{-}CH_2\text{-}Cl + H_2O$

1-Propanol — Ethyl chloride (primary alcohol)

$$(CH_3)_2CH\text{-}OH + HCl \xrightarrow[5\text{-}10\ min]{ZnCl_2} (CH_3)_2CH\text{-}Cl + H_2O$$

2-Propanol — Isopropyl chloride(Secondary alcohol)

31 Distinguish between a tertiary alcohol and a primary alcohol? (2 times)

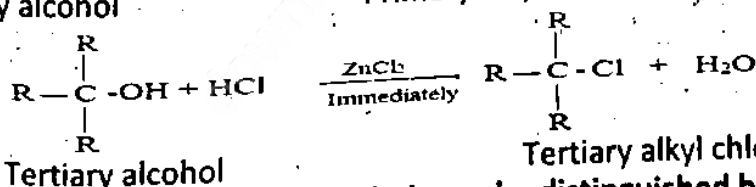
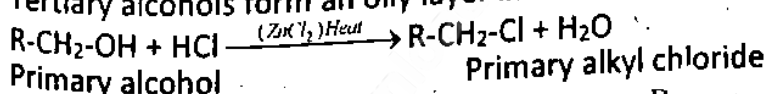
Ans: Primary and tertiary alcohols are identified and distinguished by reacting them with con. HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions:

Primary alcohols form an oily layer only on heating.
Tertiary alcohols form an oily layer immediately.

$R\text{-}CH_2\text{-}OH + HCl \xrightarrow{(ZnCl_2)Heat} R\text{-}CH_2\text{-}Cl + H_2O$

Primary alcohol — Primary alkyl chloride

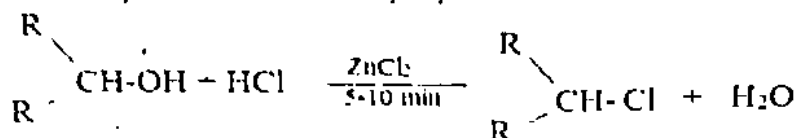
$$R_3C\text{-}OH + HCl \xrightarrow[Immediately]{ZnCl_2} R_3C\text{-}Cl + H_2O$$

Tertiary alcohol — Tertiary alkyl chloride

32 How secondary and tertiary Alcohols can be distinguished by Lucas Test?

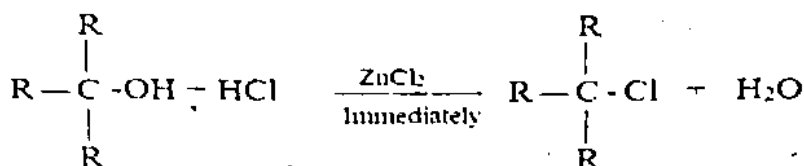
(3 times)

Ans: Secondary and tertiary alcohols are identified and distinguished by reacting them with con. HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions:

(i) Secondary alcohols for an oily layer in five to ten minutes.

$$R_2CH\text{-}OH + HCl \xrightarrow[5\text{-}10\ min]{ZnCl_2} R_2CH\text{-}Cl + H_2O$$

Secondary alkyl chloride

(i).. Tertiary alcohols form an oily layer immediately.

$$R_3C\text{-}OH + HCl \xrightarrow[Immediately]{ZnCl_2} R_3C\text{-}Cl + H_2O$$

Tertiary alkyl chloride

Topic No: 11.4

33 Write four uses of each methanol and ethanol (ethyl alcohol). (5 times)

Ans: Methanolis used as solvent for fats oils, paints, varnishes, it is also used as antifreeze in the radiators of automobiles and for denaturing of alcohol.

Ethanolis used as a solvent, as a drink and as a fuel in some countries. Moreover, it is used in pharmaceutical preparations and as a preservatives for biological specimen.

34 Give any four uses of methyl alcohol? (2 times)

Ans: (i).. It is used as solvent for fats oils, paints, varnishes.

(ii).. It is also used as antifreeze in the radiators of automobiles.

(iii).. It is used for denaturing of alcohol.

(iv).. It is used as a volatile liquid in gas chromatography(GC).

35 What are the important uses of alcohol? (2 times)

Ans: Methanolis used as solvent for fats oils, paints, varnishes, it is also used as antifreeze in the radiators of automobiles and for denaturing of alcohol.

Ethanolis used as a solvent, as a drink and as a fuel in some countries. Moreover, it is used in pharmaceutical preparations and as a preservatives for biological specimen.

Topic No: 11.5

36 Distinguish between an alcohol and a phenol by a chemical reaction? (2 times)

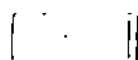
Ans: (i).. Alcohols does not react with bases but phenol reacts and give salts.

(ii).. Alcohols react with bromine water and phenol reacts to give white ppt of tribromophenol.

37. Write formula of carbolic acid and its one use.

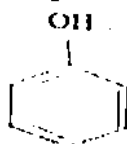
Ans: **Formula of carbolic acid:**

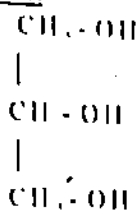
Carbolic acid: C_6H_5OH

OH

Uses:It is poisonous and used as a disinfectant in hospitals and washrooms.

38. Write structural formula of the compounds.: (a) Carbolic acid (b) Glycerol.

Ans: **Structural formula of Carbolic acid:**

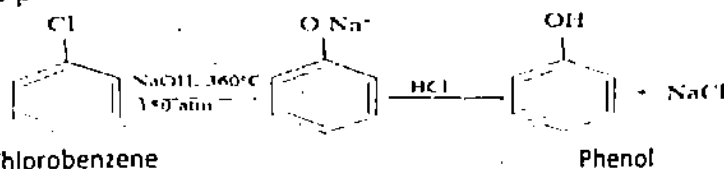
OH

Structural formula of Glycerol:

$$\begin{array}{c} CH_2-OH \\ | \\ CH-OH \\ | \\ CH_2-OH \end{array}$$

Topic No: 11.5.1

39 Prepare phenol from chlorobenzene by Dow's method? (7 times)

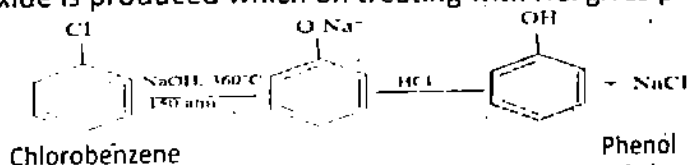
Ans: In Dow's method chlorobenzene is treated with 10% NaOH at 360ºC and 150 atmospheres pressure. Sodium phenoxide is produced which on treating with HCl gives phenol as:

$$C_6H_5Cl \xrightarrow[150\,atm]{NaOH,\ 360^\circ C} C_6H_5O^-Na^+ \xrightarrow{HCl} C_6H_5OH + NaCl$$

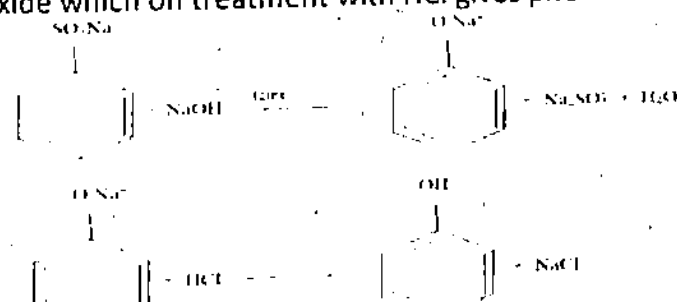
Chlorobenzene Phenol

40 Write down two methods for the preparation of phenol? (4 times)

Ans: (i).. **Prepare phenol by Dow's method:-** In Dow's method chlorobenzene is treated with 10% NaOH at 360ºC and 150 atmospheres pressure. Sodium phenoxide is produced which on treating with HCl gives phenol as:

$$C_6H_5Cl \xrightarrow[150\,atm]{NaOH,\ 360^\circ C} C_6H_5O^-Na^+ \xrightarrow{HCl} C_6H_5OH + NaCl$$

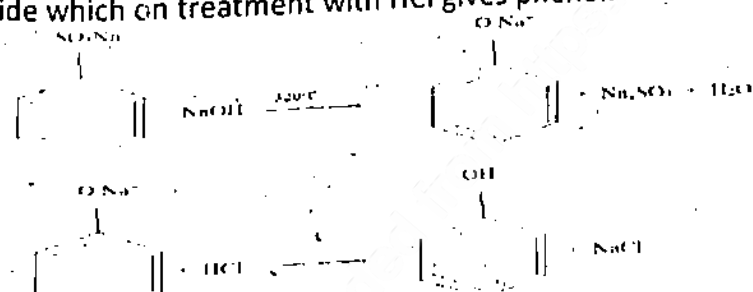
Chlorobenzene Phenol

(ii).. **Prepare phenol by Sodium salt of benzene sulphonic acid:-** Sodium salt of benzene sulphonic acid reacts with NaOH at 320ºC to give sodium phenoxide which on treatment with HCl gives phenol.

$$C_6H_5SO_3Na + NaOH \xrightarrow{320^\circ C} C_6H_5O^-Na^+ + Na_2SO_3 + H_2O$$

$$C_6H_5O^-Na^+ + HCl \longrightarrow C_6H_5OH + NaCl$$

41. Describe a method for preparation of phenol from sodium salt of benzene sulphonic acid. (3 times)

Ans: Sodium salt of benzene sulphonic acid reacts with NaOH at 320ºC to give sodium phenoxide which on treatment with HCl gives phenol.

$$C_6H_5SO_3Na + NaOH \xrightarrow{320^\circ C} C_6H_5O^-Na^+ + Na_2SO_3 + H_2O$$

$$C_6H_5O^-Na^+ + HCl \longrightarrow C_6H_5OH + NaCl$$

Topic No: 11.5.4

42 Why Phenol is acidic while alcohol is not? / Why phenol is more acidic than that of alcohol? (7 times)

Ans: **Phenol is acidic:-** Phenol is much more acidic than alcohols but less acidic than carboxylic acids. Phenoxide formed by the dissociation of phenol. The negative charge on oxygen atom can become involved with the π-electron cloud on the benzene ring. The negative charge is thus delocalized in the ring and the

phenoxide ion becomes relatively stable. This type of delocalization is not possible in alcohols.

43 Explain acidic behaviour of phenol. **(5 times)**

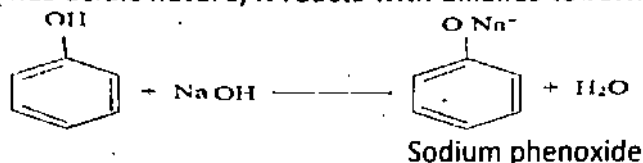
Ans: Phenoxide ion is formed by the dissociation of phenol. The negative charge on oxygen atom can become involved with the π-electron cloud on the benzene ring. The negative charge is thus delocalized in the ring and the phenoxide ion becomes relatively stable.

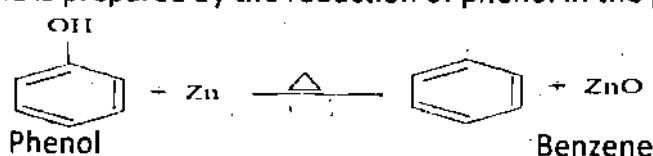
Topic No: 11.5.5

44 How does phenol react with alkali?

Ans: Phenol has acidic nature, it reacts with alkalies to form salts. For example:

$$C_6H_5OH + NaOH \longrightarrow C_6H_5O^-Na^+ + H_2O$$

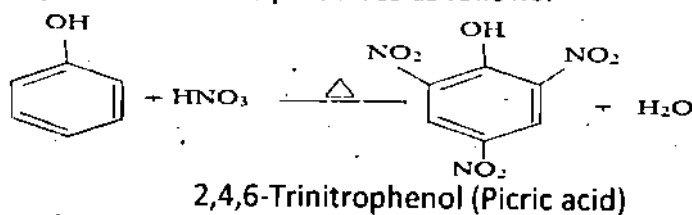
Sodium phenoxide

45 Prepare Benzene and Picric acid from Phenol?

Ans: **Benzene** is prepared by the reduction of phenol in the presence of Zn as:

$$C_6H_5OH + Zn \xrightarrow{\Delta} C_6H_6 + ZnO$$

Phenol Benzene

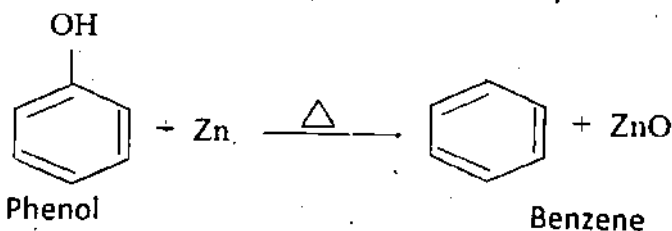
Picric acid is synthesized by the nitration of phenol. Phenol reacts with dil and conc. HNO_3 at different temperatures as follows:

$$C_6H_5OH + HNO_3 \xrightarrow{\Delta} C_6H_2(NO_2)_3OH + H_2O$$

2,4,6-Trinitrophenol (Picric acid)

46 How phenol can be converted into Benzene?

Ans: Benzene is prepared by the reduction of phenol in the presence of Zn as:

$$C_6H_5OH + Zn \xrightarrow{\Delta} C_6H_6 + ZnO$$

Phenol Benzene

47. How phenol is identified chemically?

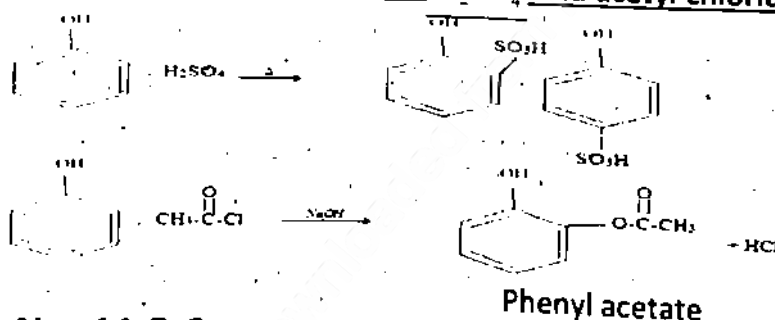
Ans: An aqueous solution of phenol reacts with bromine water to give white ppt. of 2,4,6 tribromophenol. Thus the colour of bromine is discharged.

48. Give the reaction of phenol with conc. H_2SO_4 and acetyl chloride. / Give the formation of ortho and para hydroxy benzene sulphonic acid from phenol.

Ans: **Reaction of phenol with conc. H_2SO_4 and acetyl chloride:**

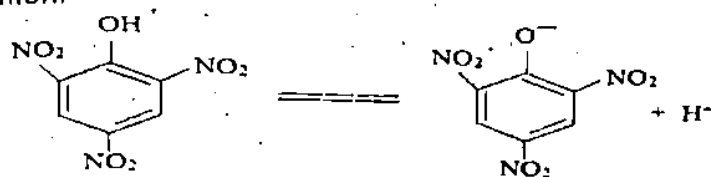
$$C_6H_5OH + H_2SO_4 \xrightarrow{\Delta} o\text{-}HOC_6H_4SO_3H + p\text{-}HOC_6H_4SO_3H$$

$$C_6H_5OH + CH_3COCl \xrightarrow{NaOH} C_6H_5OCOCH_3 + HCl$$

Phenyl acetate

Topic No: 11.5.6

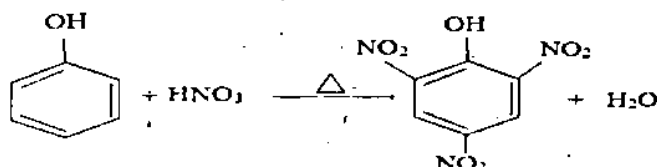
49 Picric acid is a phenol which behaves like an acid. Justify.

Ans: Picric acid is 2,4,6-trinitrophenol. It is actually phenol but has three nitro groups attached to the benzene ring of phenol. Nitro groups are electron with drawing

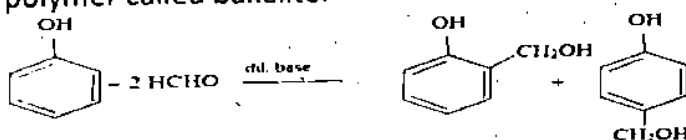
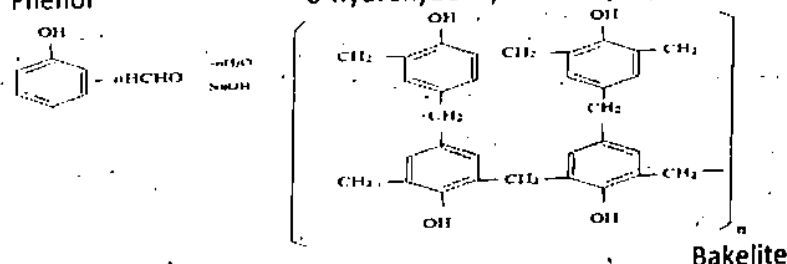
In nature. Nitro groups attracts electrons to themselves and makes easy for phenolic part to donate proton easily, so picric acid can donate a proton and behave like an acid. Moreover, after donating a proton the base of picric acid is stable anion.

Picric Acid

50 How does picric acid synthesis take place?

Ans: Picric acid is synthesized by the nitration of phenol. Phenol reacts with dil and conc. HNO_3 at different temperatures as follows:

$$C_6H_5OH + HNO_3 \xrightarrow{\Delta} C_6H_2(NO_2)_3OH + H_2O$$

2,4,6-Trinitrophenol (Picric acid)

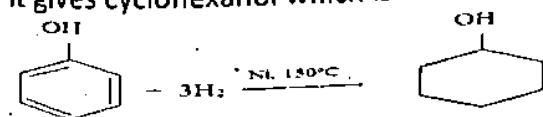
51 Give chemical reactions for preparation of Bakelite? **(4 times)**

Ans: Phenol reacts with formaldehyde in the presence of acid or alkali to give hydroxyl benzyl alcohol which on further reaction with other phenol molecules yields a polymer called bakelite.

Phenol o-hydroxybenzyl alcohl p-hydroxybenzyl alcohl

Bakelite

52 Convert phenol to an alcohol?

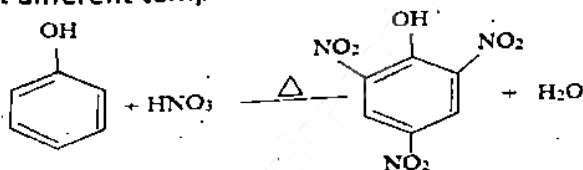
Ans: **Conversion of phenol to an alcohol:-**

When hydrogen is passed through phenol at 150C in the presence of Ni catalyst it gives cyclohexanol which is an alcohol.

$$C_6H_5OH + 3H_2 \xrightarrow{Ni,\ 150^\circ C} C_6H_{11}OH$$

Phenol Cyclohexanol

53 Conc.HNO_3 reacts with Phenol to give picric acid .How ?

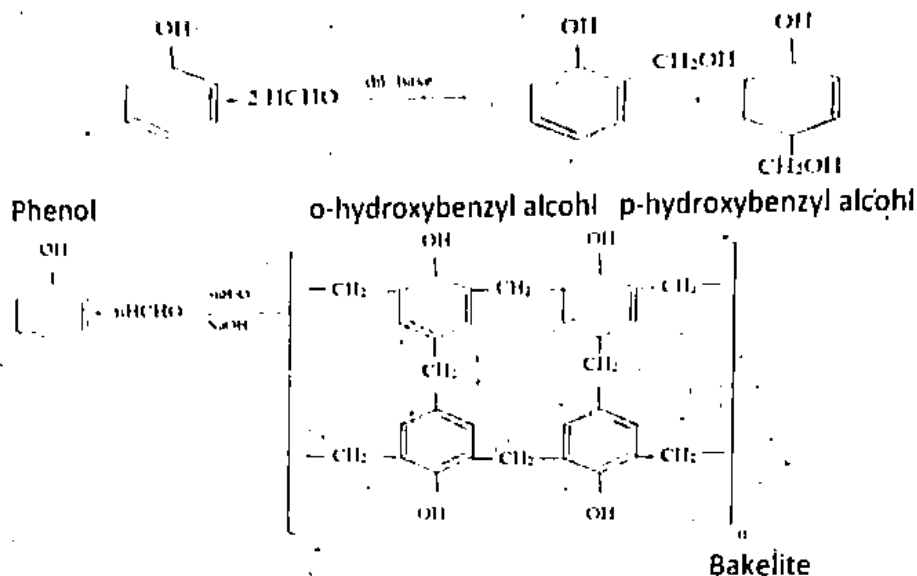
Ans: Picric acid is synthesized by the nitration of phenol. Phenol reacts with conc. HNO_3 at different temperatures as follows:

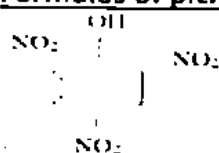
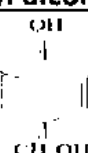
$$C_6H_5OH + HNO_3 \xrightarrow{\Delta} C_6H_2(NO_2)_3OH + H_2O$$

2,4,6-Trinitrophenol (Picric acid)

54. Write the reaction of phenol with methanal.

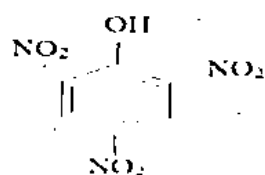
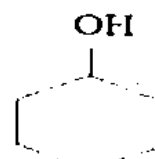
Ans: Phenol reacts with formaldehyde in the presence of acid or alkali to give hydroxyl benzyl alcohol which on further reaction with other phenol molecules yields a polymer called bakelite.

Phenol o-hydroxybenzyl alcohl p-hydroxybenzyl alcohl

Bakelite

55. Write down the formulas of picric acid and p-hydroxy benzyl alcohol.

Ans: **Formulas of picric acid and p-hydroxy benzyl alcohol:**

(i). Picric acid: (ii). p-hydroxy benzyl alcohol:

56 Draw the structures of picric acid and cyclo-hexanol.

Ans:

(2,4,6- Trinitrophenol) (Picric acid)

Cyclo-hexanol

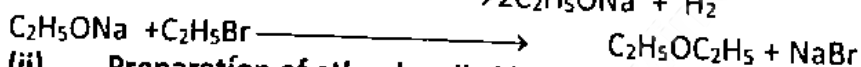
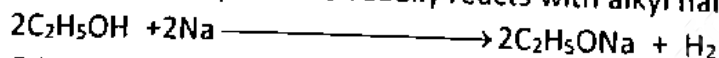
Topic No: 11.6

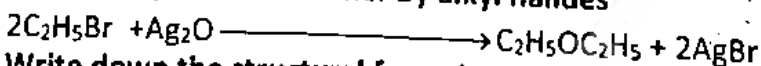
57 Write two methods for the preparation of ethers?

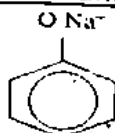
Ans: **(i).. Preparation of ether by Williamson's synthesis**

Alcohols are reacted with metallic sodium to form alkoxides. This alkoxide ion is a strong nucleophile and readily reacts with alkyl halide to produce an ether.

$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$

$C_2H_5ONa + C_2H_5Br \longrightarrow C_2H_5OC_2H_5 + NaBr$

(ii).. Preparation of ether by alkyl halides

$2C_2H_5Br + Ag_2O \longrightarrow C_2H_5OC_2H_5 + 2AgBr$

58 Write down the structural formulas of sodium phenoxide and methoxyethane?

Ans: **Structural formulas of sodium phenoxide and methoxy ethane:-**

Sodium phenoxide:

Methoxy ethane: $CH_3OC_2H_5$

Topic No: 11.6.1

59 Write IUPAC names for these compounds:

(i).. $CH_3 - CH_2-O-CH_3$ (ii).. $CH_3-O-CH_2-CH_2-CH_3$

Ans: (i).$CH_3-CH_2-O-CH_3$: Ethoxy ethane

(ii)..$CH_3-O-CH_2-CH_2-CH_3$: Methoxy propane

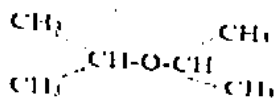
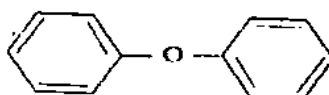
60 Draw structure of (a) Di-isopropyl ether (b) Di-phenyl ether ?

Ans:

(a) Di-isopropyl ether

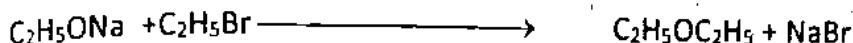
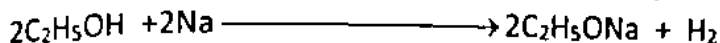
$$\begin{matrix} CH_3 & & & & CH_3 \\ & CH-O-CH & \\ CH_3 & & & & CH_3 \end{matrix}$$

(b) Di-phenyl ether

$$C_6H_5-O-C_6H_5$$

61 Prepare diethyl ether by Williamson's synthesis?

Ans: Alcohols are reacted with metallic sodium to form alkoxides. This alkoxide ion is a strong nucleophile and readily reacts with alkyl halide to produce an ether.

$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$

$C_2H_5ONa + C_2H_5Br \longrightarrow C_2H_5OC_2H_5 + NaBr$

Topic No: 11.6.4

62 Ethers belong to an inert class of organic compounds. Discuss.

Ans: Ethers are comparatively inert substances. The reagents like ammonia, alkalies, dilute acids and metallic sodium, have no action on ethers on cold state. Moreover, they are not oxidized or reduced easily.

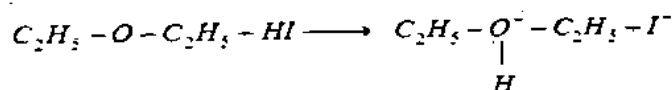
63 Ethers are less reactive than alcohols. Justify

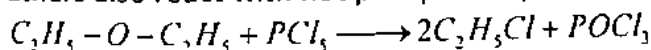
Ans: Ethers are comparatively inert substances. The reagents like ammonia, alkalies, dilute acids and metallic sodium, have no action on ethers on cold state. Moreover, they are not oxidized or reduced easily.

On the other hand alcohols can react with reagents due to C-O and O-H bonds. These can be oxidized and reduced. Alcohols also undergo dehydration reaction.

64. Give the chemical reaction of Diethyl Ether with HI and PCl_5.

Ans: With hydrogen iodide ethers give alcohols which can react further to give alkyl iodides.

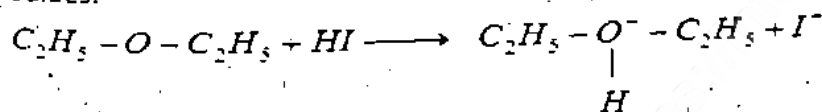
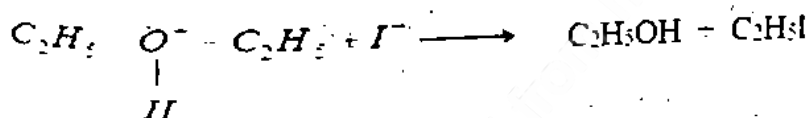
$$C_2H_5-O-C_2H_5-HI \longrightarrow C_2H_5-\underset{\displaystyle H}{\underset{|}{O^-}}-C_2H_5-I^-$$

Ethers also react with hot phosphorus pentachloride to give alkyl chloride.

$$C_2H_5-O-C_2H_5+PCl_5 \longrightarrow 2C_2H_5Cl+POCl_3$$

65 What happens when hydrogen iodide is added to ethers?

Ans: With hydrogen iodide ethers give alcohols which can react further to give alkyl iodides.

$$C_2H_5-O-C_2H_5+HI \longrightarrow C_2H_5-\underset{\displaystyle H}{\underset{|}{O^-}}-C_2H_5+I^-$$

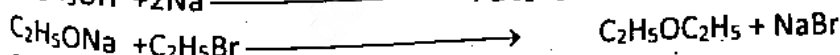
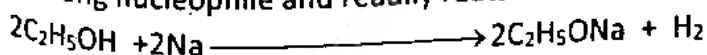
Oxonium ion

$$C_2H_5\ \underset{\displaystyle H}{\underset{|}{O^-}}\ C_2H_5+I^- \longrightarrow C_2H_5OH + C_2H_5I$$

Topic No: 11.6.2

66 Show reactions to prepare ethers by Williamson's synthesis? (11 times)

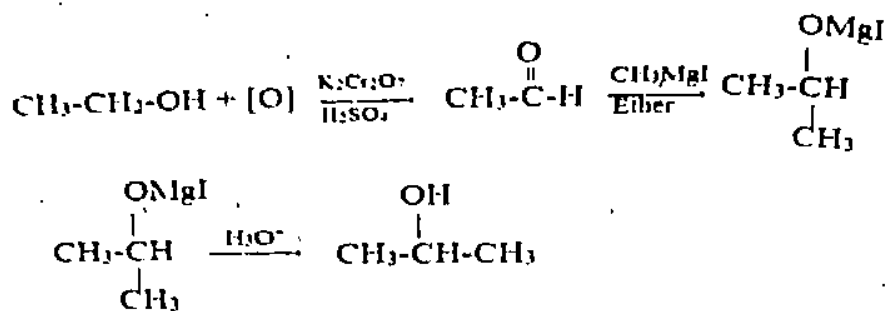
Ans: Alcohols are reacted with metallic sodium to form alkoxides. This alkoxide ion is a strong nucleophile and readily reats with alkyl halide to produce an ether.

$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$

$C_2H_5ONa + C_2H_5Br \longrightarrow C_2H_5OC_2H_5 + NaBr$

67 Convert Ethanol into isopropyl alcohol?

Ans: **Conversion of Ethanol into isopropyl alcohol:-**

$$CH_3-CH_2-OH + [O] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow[Ether]{CH_3MgI} CH_3-\underset{CH_3}{\underset{|}{\overset{OMgI}{\overset{|}{CH}}}}$$

$$CH_3-\underset{CH_3}{\underset{|}{\overset{OMgI}{\overset{|}{CH}}}} \xrightarrow{H_3O^+} CH_3-\overset{OH}{\overset{|}{CH}}-CH_3$$

Isopropyl alcohol

68 Arrange the given compounds in order of increasing acid strength.
H_2O, C_2H_5OH , phenol, Benzoic acid?

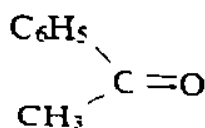
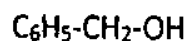
Ans: C_2H_5OH < H_2O <phenol<Benzoic acid

69. Write down the formula of Acetophenone and Benzyl Alcohol.

Ans: **Formula of Acetophenone and Benzyl Alcohol:**

$$\begin{matrix} C_6H_5 \\ \quad \diagdown \\ \qquad C=O \\ \quad \diagup \\ CH_3 \end{matrix}$$

Acetophenone

$C_6H_5-CH_2-OH$

Benzyl alcohol:

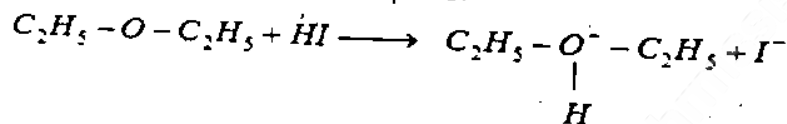
2018

70. Define the following terms (i) Phenols (ii) Oxonium ions.

Ans: **Definitions:**

Aromatic compounds which contain one or more OH groups directly attached with carbon of benzene ring are called **Phenols**. The simplest example is phenol which is also known as Carbolic acid i.e. C_6H_5OH.

Oxonium ion is any oxygen cations with three bonds. The simplest oxonium ion is hydronium ion H_3O^+. Another example is:

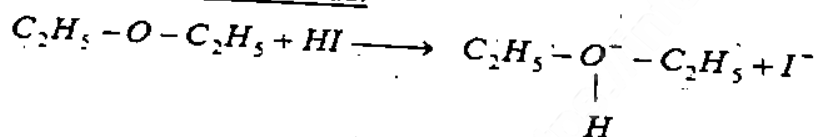
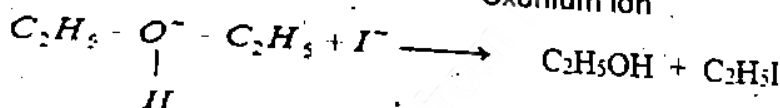
$$C_2H_5-O-C_2H_5+HI \longrightarrow C_2H_5-\underset{H}{\underset{|}{O^+}}-C_2H_5+I^-$$

Oxonium ion

71. How ethyl iodide is prepared from diethyl ether?

Ans: **Preparation of Ethyl Iodide:**

$$C_2H_5-O-C_2H_5+HI \longrightarrow C_2H_5-\underset{H}{\underset{|}{O^+}}-C_2H_5+I^-$$

Oxonium ion

$$C_2H_5-\underset{H}{\underset{|}{O^+}}-C_2H_5+I^- \longrightarrow C_2H_5OH + C_2H_5I$$

Ethyl iodide

72. Ethanol has higher boiling point than diethyl ether. Give reason?

Ans: **Boiling Points:**

Ethanol has higher boiling point than diethyl ether because ethanol has strong hydrogen bonding present in molecules while ether don't show hydrogen bonding with in its molecules.

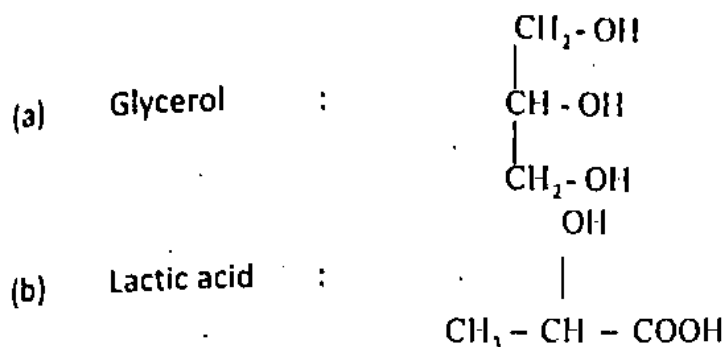
73. Write down structural formula of following compounds.
(a) Glycerol (b) Lactic acid

Ans: **Structural formulae**

(a) Glycerol :

$$\begin{array}{l} CH_2-OH \\ | \\ CH-OH \\ | \\ CH_2-OH \end{array}$$

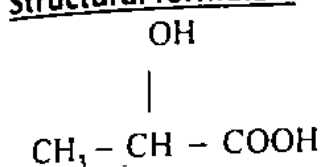
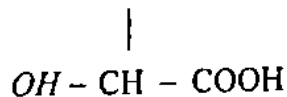
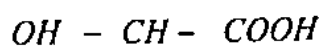
(b) Lactic acid :

$$\begin{array}{c} OH \\ | \\ CH_3-CH-COOH \end{array}$$

74. Write structural formula of lactic acid and tartaric acid?

Ans: <u>**Structural formulae:**</u>

$$\begin{array}{c} OH \\ | \\ CH_3-CH-COOH \end{array}$$

Lactic acid

$$\begin{array}{c} OH-CH-COOH \\ | \\ OH-CH-COOH \end{array}$$

Tartaric acid

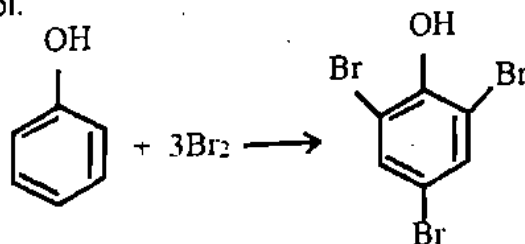
75. Why are lower alcohols more soluble in water than higher alcohols

Ans: Lower alcohols more soluble in water than higher alcohols because solubility of alcohols is due to hydrogen bonding which is prominent in lower alcohols but diminishes in higher alcohols.

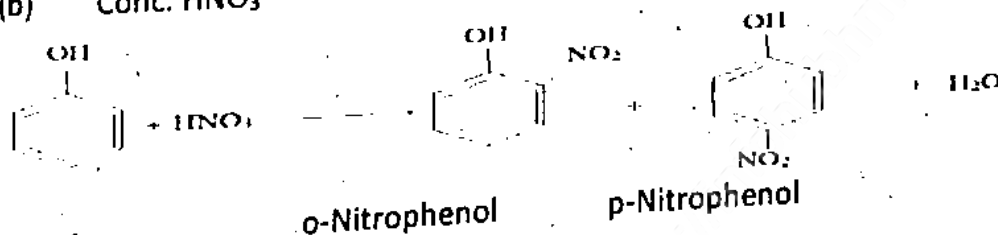
76. Write reaction of phenol with (a) Bromine water (b) Conc. HNO_3

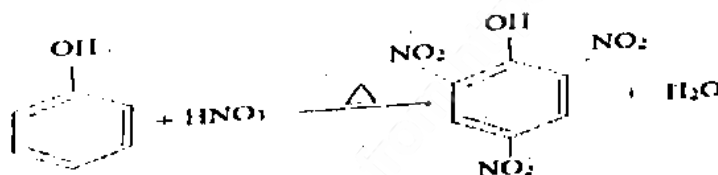
Ans: **(a) Bromine water**

An aqueous solution of phenol reacts with bromine water to give white ppt of 2,4,4- tribromophenol.

$$C_6H_5OH + 3Br_2 \longrightarrow C_6H_2Br_3OH$$

2,4,4- tribromophenol

(b) Conc. HNO_3

$$C_6H_5OH + HNO_3 \longrightarrow o\text{-}NO_2C_6H_4OH + p\text{-}NO_2C_6H_4OH + H_2O$$

o-Nitrophenol p-Nitrophenol

$$C_6H_5OH + HNO_3 \xrightarrow{\Delta} C_6H_2(NO_2)_3OH + H_2O$$

2,4,6-Trinitrophenol (Picric acid)

2019

77. Define (a) Absolute alcohol (b) Rectified Spirit (c) Methylated spirit (d) Denaturing of alcohol

Ans: **(a) Absolute alcohol:**

99.9% pure alcohol is called absolute alcohol.

(b) Rectified spirit:

95% alcohol is called rectified spirit.

(c) Denaturing of alcohol:

Alcohol is denaturing by adding 10% methanol to avoid its drinking purpose.

(d) Methylated spirit:

Alcohol in which there is 10% methanol is called rectified spirit.

78. Write structures of (i) methyl-n-propylether (ii) methoxybenzene.

Ans: (i) **Methyl-n-propylether:**

$$CH_3-O-CH_2CH_2CH_3$$

(ii) **Methoxybenzene**

$$CH_3OC_6H_5$$

79. Give classification of monohydric alcohols with examples.

Ans: Monohydric alcohols are classified into primary, secondary and tertiary alcohol.

CH_3-CH_2-OH *Primary alcohol*

$$\begin{array}{c} CH_3 \\ | \\ CH_3-CH-OH \end{array}$$ *Secondary alcohol*

$$\begin{array}{c} CH_3 \\ | \\ CH_3-C-OH \\ | \\ CH_3 \end{array}$$ *Tertiary alcohol*

80. Why are alcohols, phenols and ethers considered as derivatives of water.

Ans:

Alcohol Phenol Ether

Alcohols, phenols and ethers are close in structure to water so therefore considered as derivatives of water.

81. Prepare ethanol from starch.

Ans: **From starch:**

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[Yeast]{Diastase} nC_{12}H_{22}O_{11}$$

Starch *maltose*

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{Maltase} 2C_6H_{12}O_6$$

Glucose

$$C_6H_{12}O_6 \xrightarrow{Zymase} 2C_2H_5OH + 2CO_2$$

82. Convert ethanol to iodoform.

Ans:

$$C_2H_5OH + 4I_2 + 6NaOH \longrightarrow CHI_3 + HCOONa + 5NaI + 5H_2O$$

iodoform

2021

83. What is the reaction given by Phenol on: (a) HNO_3 **(b) Zn (dust)**

Ans: (a) Reaction of Phenol with HNO_3**:**

Picric acid is synthesized by the nitration of phenol. Phenol reacts with dil and conc. HNO_3 at different temperatures as follows:

2,4,6-Trinitrophenol (Picric acid)

(b) **Reaction of Phenol with Zn (dust):**

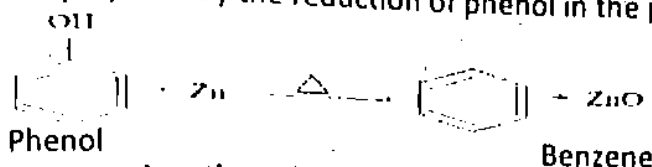
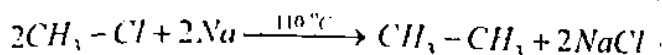
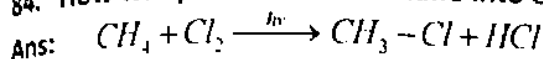
Benzene is prepared by the reduction of phenol in the presence of Zn as:

$$C_6H_5OH + Zn \xrightarrow{\Delta} C_6H_6 + ZnO$$

Phenol Benzene

84. **How will you convert methane into ethane?**

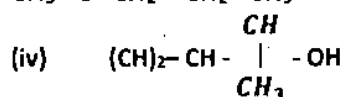
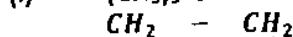
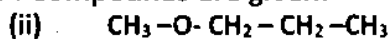
Ans: $CH_4 + Cl_2 \xrightarrow{hv} CH_3-Cl + HCl$

$$2CH_3-Cl + 2Na \xrightarrow{110^\circ C} CH_3-CH_3 + 2NaCl$$

CHAPTER NO:11 LONG QUESTIONS ALCOHOLS, PHENOLS AND ETHERS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 11.2.1

1. Write I.U.P.A.C. names of followings : Compounds are given:

(i) $(CH_3)_3$-C-OH (ii) $CH_3-O-CH_2-CH_2-CH_3$

(iii) $CH_2(OH)-CH_2(OH)$ (iv) $(CH)_2-CH-CH(CH_3)-OH$

Ans: (Text Book Page No:212)

Topic No: 11.2.2

2. How ethyl alcohol is obtained by the fermentation of molasses and starch? (6 times)

Ans: (Text Book Page No:215)

3. Give industrial preparation of ethyl alcohol. (2 times)

Ans: (Text Book Page No:215)

4. How methanol is prepared in industry? (3 times)

Ans: (Text Book Page No:231)

Topic No: 11.2.4

5. Convert methanol to ethanol and ethanol to methanol.
6. Prepare ethyl acetate. Ethanol, ethane and diethyl ether from ehthanol.

Ans: (Text Book Page No:223)

Topic No: 11.2.5

7. Write the Chemical reactions of C_2H_5OH with followings with conditions.

(i) $SOCl_2$ (ii) HCl (iii) NH_3 (iv) Na

Ans: (Text Book Page No:217)

Topic No: 11.2.7

8. Explain the following terms using ethyl alcohol:

Oxidation ii) Dehydration

Ans: (Text Book Page No:217+218)

9. Describe reactions of ethanol and propanone with (i) Hydroxylamine (ii) Phenylhydrazine

Ans: (Text Book Page No:217)

10. Describe the ease of dehydration of primary, secondary and tertiary alcohol with suitable reagent.

Ans: (Text Book Page No:217)

11. How does ethyl alcohol react with following reagents:
(i) Conc.H_2SO_4 (ii) Na (iii) CH_3COOH (iv) $SOCl_2$

Ans: (Text Book Page No:217)

Topic No: 11.3

12. How will you distinguish between primary, secondary and tertiary alcohols? Explain with reactions. (2 times)

Ans: (Text Book Page No:218)

Topic No: 11.5.1

13. Write two methods for the preparation of phenol. How does phenol react with:i) Con. HNO_3 ii) Bromine water (8 times)

Ans: (Text Book Page No:219)

14. What is Dow's method for the preparation of Phenol? Explain acidic behaviour of phenol. (5 times)

Ans: (Text Book Page No:219)

Topic No: 11.5.5

15. How Phenol reacts with: (3 times)
i) Zn ii) NaOH iii) HNO_3 iv) H_2SO_4 v) bromine water

Ans: (Text Book Page No:221)

16. Write the chemical reaction of phenol with following. (2 times)
(i) NaOH (ii) Zn (iii) CH_3COCl (iv) H_2

Ans: (Text Book Page No:220+221)

17. Describe any four chemical reactions of carbolic acid.

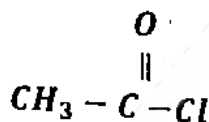
Ans: (Text Book Page No:221)

18. Write down two methods for preparing phenol. What is the reaction of phenol with i) Z_n ii) Br_2 water (2 times)

Ans: (Text Book Page No:219)

Topic No: 11.5.6

19. Give the reaction of phenol with:

(i) HNO_3 (ii) H_2SO_4 (iii) $CH_3-\overset{O}{\overset{\|}{C}}-Cl$

Ans: (Text Book Page No:221)

20. How will you convert ethane into (i) ethyl alcohol (ii) ethylene epoxide (iii) ethylene glycol (iv) ethylene chlorohydrins?

Ans: (Text Book Page No:154)

21. Convert phenol into : (i) Picric acid. (ii) Cyclohexanol. (iii) Bakelite. (2 times)

As: (Text Book Page No:221)

22. How will you convert: (2 times)
i) Ethanol into Methanol
ii) Ethanol into Ethanol
iii) Ethanol into Ethene
iv) Ethanol into diethyl ether

Topic No: 11.6.2

23. How ethers are prepared and how do they react with hydrogen iodide?

Ans: (Text Book Page No:223+224)

24. Write structural formula of:
(i) Glycerol (ii) Carbolic acid (iii) Sodium Ethoxide (iv) Propoxy propane

Ans: (Text Book Page No:213)

2018

25. How is methyl alcohol is obtained on large scale from water gas? Draw diagram also.

Ans: (Text Book Page No:214)

26. How are monohydric alcohols classified? Write preparation of ethyl alcohol from molasses.

Ans: (Text Book Page No:218)

27. Write reactions of phenol with (i) HNO_3/Δ (ii) H_2SO_4 (Conc) (iii) Br_2(iv) CH_3COCl
Ans: (Text Book Page No:221)

28. How is methyl alcohol is obtained on large scale? How is it distinguished from ethyl alcohol.

2021

29. Starting from phenol prepare the following compounds:
30. Give the preparation of methyl alcohol on large scale. How it may be distinguished from ethyl alcohol.
31. Write reactions of alcohol in which C-O bond and O-H bond breaks (Two reactions in each case).
32. How phenol is prepared from
(i) Chlorobenzene (ii) Sodium salt of Benzene Sulphonic Acid

CHAPTER NO:12 OBJECTIVES (MCQ'S) ALDEHYDE AND KETONES IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 12.1

1. The carbon atom of a carbonyl group is: (8 times)
(a) sp-hybridized (b) sp^2-hybridized (c)benzoic acid (d) butanoic acid

Topic No: 12.2.1

2 Aldehydes react with hydroxylamine in acidic solution to give:
(a) An oxime (b) Aldol (c) Polymer (d) Acetic acid

Topic No: 12.3

3. Katones are prepared by the oxidation of: (2 times)
(a) Primary alcohol (b) Secondary alcohol (c) Tertiary alcohol (d)Polyhydric alcohol

Topic No: 12.4

4. Both aldehydes and ketones reacts with?
(a) Grignard reagent (b) Tollen's reagent (c) Fehling's reagent (d) Benedict's reagent

5. The carbon atom of a carbonyl group is : (4 times)
(a)sp-hybridized (b) sp^2-hybridized (c)sp^3-hybridized (d)sp-sp hybridized

6. The state of hybridization of carbon atom in HCHO is:
(a) dsp^2 (b) Sp^3 (c) Sp^2 (d) Sp

Topic No: 12.5.1

7. Acetone reacts with HCN to form a cyanohydrin. It is an example of: (7 times)
(a)Nucleophilic addition (b)Substitution reaction (c) Elimination reaction (d)None

8. Cannizzaro's reaction is not given by: (9 times)
(a) Formaldehyde (b) Acetaldehyde (c)Benzaldehyde (d)Trimethylacetaldehyde

9. Which compound will not give iodoform test on treatment with I_2 /NaOH? (8 times)
(a) Acetaldehyde (b) Acetone (c) Butanone (d) 3-pentanone

10- Cannizzaro's reaction is given by: (2 times)
(a) Acetaldehyde (b) Formaldehyde (c) Propanal (d) Propanone

11. Cannizzaro's reaction is not given by: (3 Times)
(a) HCHO (b) CHO (c)$(CH_3)_3C-CO-H$ (d) CH_3-CO-H

12. Addition of alcohol in carbonyl compounds gives acetal. The geometry of acetalis:
(a) Linear (b) Trigonal (c) Tetrahedral (d) Planer

13- Which reaction is disproportionate reaction?
(a) aldol condensation (b)Cannizzaro's reaction
(c)haloform reaction (d) acid catalysed reaction

14. Aldol Condensation is given by:A (2 Times)
(A) Acetaldehyde (B) Formaldehyde (C) Benzaldehyde (D) Trimethylacetaldehyde

Topic No: 12.5.2

15. Methanol can be prepared from hydrogenation of:
(a) CH_3N (b) CH_3Br (c) HCHO (d) CH_3CHO

16. Formation of acetaldehyde from ethanol is known as:
(a) Reduction (b) Addition (c) Oxidation (d) Substitution

17. Aldehydes on reduction form:
(a) Primary alcohols (b) Secondary alcohols (c) Tertiary alcohol (d) Ketones

Topic No: 12.6

18. Which compound will react with Tollen's reagent? **(4 times)**
(a) Acetaldehyde (b) Acetone (c) Acetic acid (d) Butanone

19. In the given compounds which will react with Tollen's reagents?
(a) $CH_3\text{-}OH$ (b) $CH_3\text{-}CO\text{-}CH_3$ (c) $CH_3\text{-}CHO$ (d) $CH_3\text{-}CH_2\text{-}CH_2\text{-}OH$

20. Aldehydes and ketones can be detected by:
(a) 2,4DNP test (b) Tollen's test
(c) Sodium Nitropruside test (d) Benedicts solution test

21. Silver mirror test is given by:
(a) Ethers (b) Ketones (c) Acids (d) Aldehydes

22- Which test is called silver mirror test? **(4 times)**
(a) Tollen's test (b) Fehling's test
(c) Benedict's test (d) Sodium nitro preside test

23- Which of the following reagents will reacts with both aldehyde and ketones: **(13 times)**
(a) Tollen's reagent (b) Grignard's Reagent (c) Fehling's reagent (d) Benedict's Reagent

24- Which of the following compound will react with Benedict solution?
(a) $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ (b) $CH_3-\overset{O}{\overset{\|}{C}}-H$
(c) $C_2H_5-\overset{O}{\overset{\|}{C}}-OH$ (d) $CH_3\text{-}O\text{-}CH_3$

25 Which of the following will react with Tollen'sreagent: **(3 Times)**
(a) $CH_3-\overset{O}{\overset{\|}{C}}-H$ (b) CH_3COCH_3 (c) CH_3COOH (d) $CH_3COC_2H_5$

Topic No: 12.7

26. Formaline is: **(4 times)**
(a) 10% solution of Formaldehyde in water (b) 20% solution of Formaldehyde in water
(c) 40% solution of Formaldehyde in water (d) 60% solution of Formaldehyde in water

27. Which of the following has highest boiling point: **(8 times)**
(a) methanal (b) ethanal (c) propanal (d) 2- hexanone

2019

28. The Carbon of Carbonyl Group is:
(a) Sp Hybridized (b) Sp^2 Hybridized (c) Sp^3 Hybridized (d) dSp^2 Hybridized

29. Which one of the following compounds will react with Fehling's solution? **(2 Times)**
(a) $HCOOH$ (b) $H_3C.CHO$ (c) H_3CCOOH (d) $H_3C-COCH_3$

30. Which of the following reagent will react with both aldehydes and Ketones:
(a) Tollen's reagent (b) Fehling reagent (c) Barford reagent (d) Grignard reagent

31. Which one of the following enzymes brings about the hydrolysis of fats?
(a) urease (b) lipase (c) maltase (d) zymase

2021

32. The compound used in the processing of anti-polio vaccine is:
(a) Acetaldehyde (b) Formaldehyde (c) Acetone (d) Ethyl bromide

33. The homologous series of both aldehydes and ketones have the general formula:
(a) $C_nH_{2n}O_2$ (b) C_nH_{2n+2} (c) $C_nH_{2n}O$ (d) C_nH_{2n-2}

34. Percentage of water in Formalin is:
(a) 52% (b) 8% (c) 40% (d) 60%

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

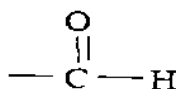
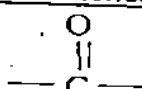
1	2	3	4	5	6	7	8	9	10	11	12	13	14
B	A	B	A	B	C	A	B	D	B	D	C	B	A
15	16	17	18	19	20	21	22	23	24	25	26	27	28
C	C	A	A	C	A	D	A	B	B	A	C	D	B
29	30	31	32	33	34								
B	D	B	B	C	A								

CHAPTER NO:12 SHORT QUESTIONS ALDEHYDE AND KETONES IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 12.1

1. Write the functional group of aldehyde and ketone, give one example of each.

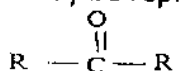
Ans: Functional group of aldehyde and ketone:

$$-\overset{\overset{\displaystyle O}{\|}}{C}-H \qquad\qquad -\overset{\overset{\displaystyle O}{\|}}{C}-$$

Functional group of aldehyde   Functional group of ketone:

2. What is the difference between aldehydes and ketones?

Ans: Aldehydes:In aldehydes, the carbonyl grojp is bonded to at leat one hydrogen atom, and so it occurs at the end of a chain. An aldehyde can be represented by the general formula $R-\overset{\overset{\displaystyle O}{\|}}{C}-H$. Where R may be H or an alkyl group.

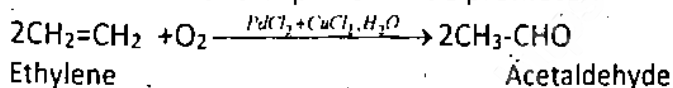
Ketones:In ketones, the carbonyl group is bonded to two carbon atoms, and so it occurs within a chain. A ketone may be represented by the general formula.

$$R-\overset{\overset{\displaystyle O}{\|}}{C}-R$$

Topic No: 12.3

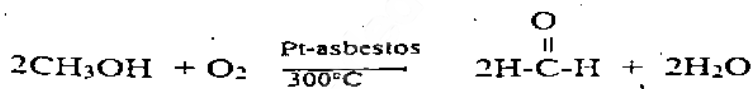
3 Give industrial preparation of acetaldehydes? / Convert ethene into ethanal. (4 times)

Ans: Acetaldehyde is prepared industrially by air oxidation of ethylene using palladium chloride with a cupric chloride promoter.

$$2CH_2=CH_2 + O_2 \xrightarrow{PdCl_2 + CuCl_2, H_2O} 2CH_3\text{-}CHO$$

Ethylene   Acetaldehyde

4 Explain one method of formation of formaldehyde from methyl alcohol.

Ans: Formaldehyde is prepared in laboratory by passing a mixture of methyl alcohol vapours and air over platinized asbestos or copper or silver catalyst at 300ºC.

$$2CH_3OH + O_2 \xrightarrow[300°C]{Pt\text{-}asbestos} 2H\text{-}\overset{\overset{\displaystyle O}{\|}}{C}\text{-}H + 2H_2O$$

5 Write methods to prepare formaldehyde and acetaldehyde?(2 times)

Ans: Formaldehyde is prepared in laboratory by passing a mixture of methyl alcohol vapours and air over platinized asbestos or copper or silver catalyst at 300ºC.

$$2CH_3OH + O_2 \xrightarrow[300°C]{Pt\text{-}asbestos} 2H\text{-}\overset{\overset{\displaystyle O}{\|}}{C}\text{-}H + 2H_2O$$

Acetaldehydeis prepared In laboratory by the oxidation of ethyl alcohol with acidified sodium dichromate solution.

$$CH_3CH_2OH+[O] \xrightarrow{Na_2Cr_2O_7+H_2SO_4, heat} CH_3CHO+H_2O$$

A mixture of ethyl alcohol and sodium dichromate solution is urn into boiling dilute sulphuric acid. Immediately a vigorous reaction takes place and the acetaldehyde formed in liquid state in immediately distilled off. This prevents the oxidation of acetaldehyde to acetic acid. Ethyl alcohol remains in solution until it is oxidized. Pure acetaldehyde is obtained by recrystallization.

6 How acetaldehyde is prepared from ethyl alcohol in the laboratory?(2 times)

Ans: Acetaldehyde is prepared in laboratory by the oxidation of ethyl alcohol with acidified sodium dichromate solution.

$$CH_3CH_2OH+[O] \xrightarrow{Na_2Cr_2O_7+H_2SO_4, heat} CH_3CHO+H_2O$$

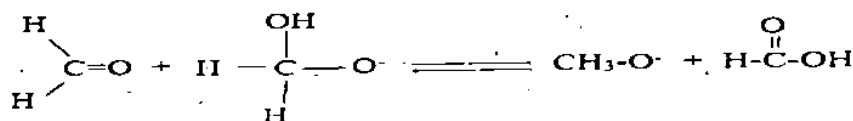
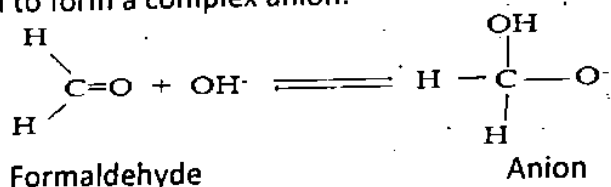
A mixture of ethyl alcohol and sodium dichromate solution is urn into boiling dilute sulphuric acid. Immediately a vigorous reaction takes place and the acetaldehyde formed in liquid state in immediately distilled off. This prevents the oxidation of acetaldehyde to acetic acid. Ethyl alcohol remains in solution until it is oxidized. Pure acetaldehyde is obtained by recrystallization.

7 Write down mechanism of Cannizzaro's reaction?

Ans: The hydroxid ion act as a nucleophile. It attacks on the electrophile carbonyl carbon to form a complex anion.

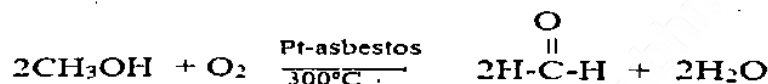
$$H_2C=O + OH^- \rightleftharpoons H-\underset{H}{\overset{OH}{C}}-O^-$$

Formaldehyde Anion

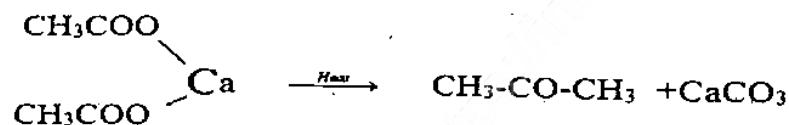
$$H_2C=O + H-\underset{H}{\overset{OH}{C}}-O^- \rightleftharpoons CH_3-O^- + H-\overset{O}{\overset{\|}{C}}-OH$$

Formaldehyde Complex anion. Methoxide ion Formic acid

8. How formaldehyde is prepared on industrial scale? (5 times)

Ans: Formaldehyde is manufactured by passing a mixture of methanol vapours and air over iron oxide-molybdenum oxide or silver catalyst at 500 °C.

$$2CH_3OH + O_2 \xrightarrow[300°C]{Pt\text{-}asbestos} 2H-\overset{O}{\overset{\|}{C}}-H + 2H_2O$$

9. PrepareAcetone from Calcium Acetate. (4 times)

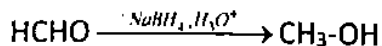
Ans: Acetone is prepared by distillation of calcium acetate.

$$(CH_3COO)_2Ca \xrightarrow{Heat} CH_3-CO-CH_3 + CaCO_3$$

Topic No: 12.5

10 Convert : Methanal ⟶ Methanol, Propanone to 2-propanol?

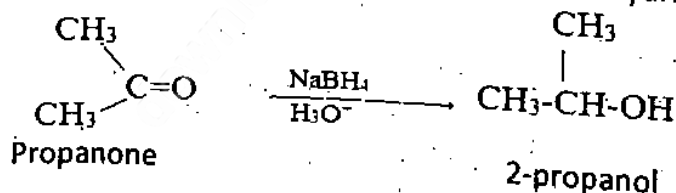
Ans: Conversion of Methanal to Methanol, Propane to 2-propanol

Methanal is reduced to alcohols with sodium borohydride, $NaBH_4$.

$$HCHO \xrightarrow{NaBH_4, H_3O^+} CH_3-OH$$

Methanal Methanol

Propanone is reduced to alcohols with sodium borohydride, $NaBH_4$.

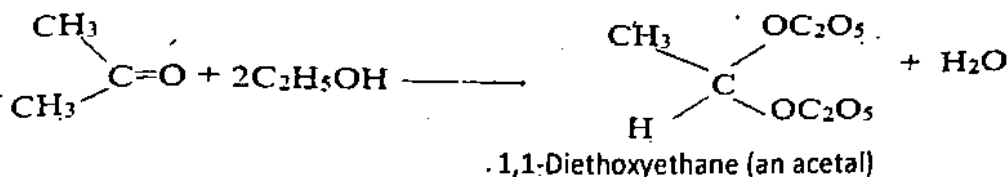
$$(CH_3)_2C=O \xrightarrow[H_3O^-]{NaBH_4} CH_3-\overset{CH_3}{\overset{|}{C}H}-OH$$

Propanone 2-propanol

Topic No: 12.5.1

11 How acetals are formed? **(2 times)**

Ans: **Formation of acetals:-**Acetaldehyde combine with alcohols in the presence of hydrogen chloride gas to form acetals. The hydrogen chloride gas acts as a catalyst. Both the alcohol and the hydrogen chloride gas must be dry.

$$(CH_3)(CH_3)C{=}O + 2C_2H_5OH \longrightarrow CH_3(H)C(OC_2O_5)(OC_2O_5) + H_2O$$

1,1-Diethoxyethane (an acetal)

12 Addition of HCN on aldehydes and ketones is a base catalyzed reaction? / Write the reactions of formaldehyde and acetaldehyde with HCN. (2 times)

Ans: Hydrogen cyanide adds to aldehydes and ketones to form cyanohydrins. The reaction is carried out by adding slowly a mineral acid to an aqueous solution of sodium cyanide. The acid generates HCN from sodium cyanide in situ.

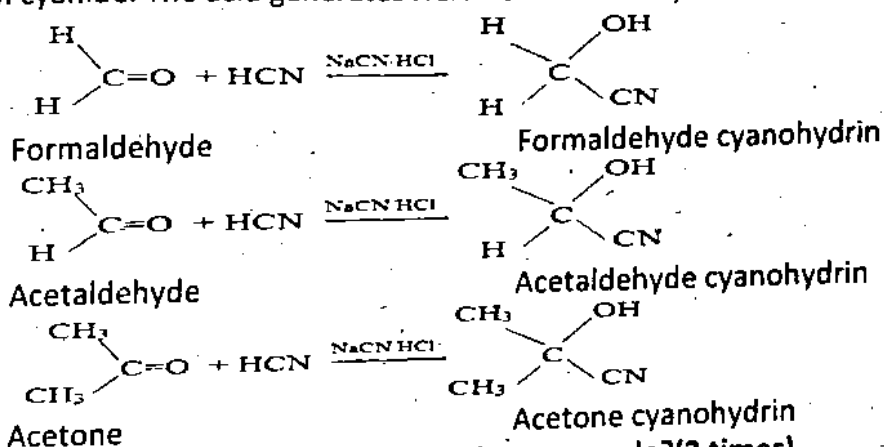
$$(H)(H)C{=}O + HCN \xrightarrow{NaCN\cdot HCl} (H)(H)C(OH)(CN)$$

Formaldehyde → Formaldehyde cyanohydrin

$$(CH_3)(H)C{=}O + HCN \xrightarrow{NaCN\cdot HCl} (CH_3)(H)C(OH)(CN)$$

Acetaldehyde → Acetaldehyde cyanohydrin

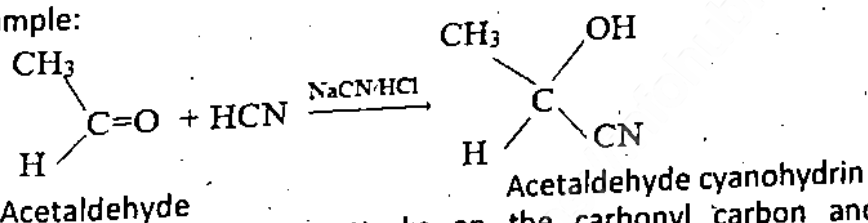
$$(CH_3)(CH_3)C{=}O + HCN \xrightarrow{NaCN\cdot HCl} (CH_3)(CH_3)C(OH)(CN)$$

Acetone → Acetone cyanohydrin

13 Define nucleophilic addition reaction with an example?(2 times)

Ans: **Nucleophilic addition reaction:-**Addition of nucleophilic reagent to the substrate (aldehyde or ketone) in the presence of some catalyst is called nucleophilic addition reaction. It is due to the unsymmetrical electronic configuration about the carbonyl group, the nucleophilic reagent can start the initial attack on the carbon.

For example:

$$(CH_3)(H)C{=}O + HCN \xrightarrow{NaCN\cdot HCl} (CH_3)(H)C(OH)(CN)$$

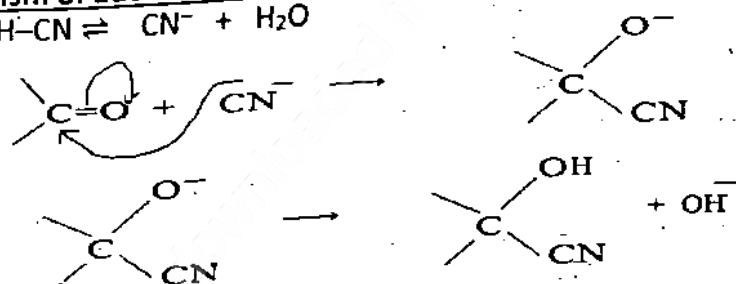
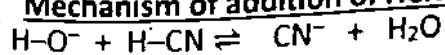
Acetaldehyde → Acetaldehyde cyanohydrin

CN^- acts as nucleophile. It attacks on the carbonyl carbon and convert acetaldehyde to acetaldehyde cyanohydrin.

14. Give the mechanism of addition of HCN to Acetone.

Ans: **Mechanism of addition of HCN to Acetone:**

$$H{-}O^- + H{-}CN \rightleftharpoons CN^- + H_2O$$

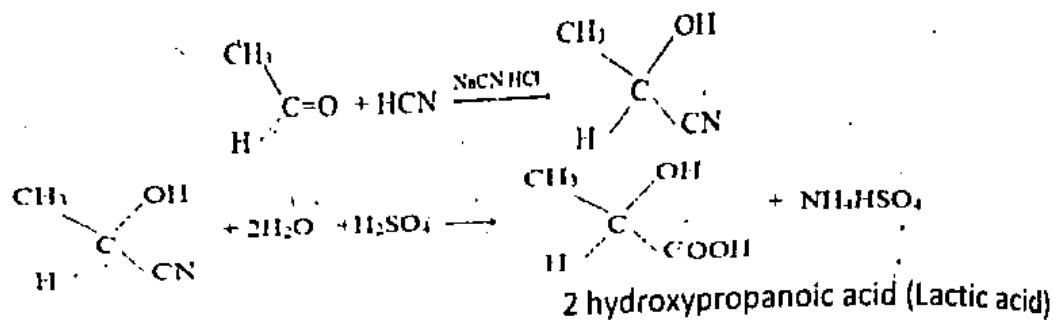
$$>C{=}O + CN^- \longrightarrow >C(O^-)(CN)$$

$$>C(O^-)(CN) \longrightarrow >C(OH)(CN) + OH^-$$

15. Convert Acetaldehyde to Lactic Acid. **(3 times)**

Ans: **Conversion of Acetaldehyde to Lactic Acid:**

$$CH_3(H)C=O + HCN \xrightarrow{NaCN\ HCl} CH_3(H)C(OH)(CN)$$

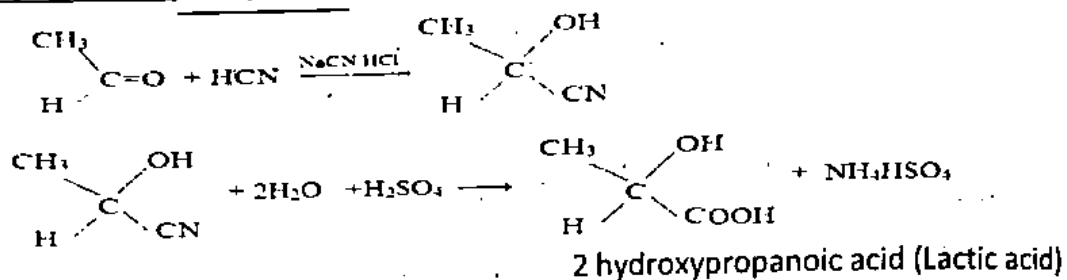
$$CH_3(H)C(OH)(CN) + 2H_2O + H_2SO_4 \longrightarrow CH_3(H)C(OH)(COOH) + NH_4HSO_4$$

2 hydroxypropanoic acid (Lactic acid)

16. How $\alpha-hydroxy$ acid is prepared from aldehydes?

Ans: **Preparation of $\alpha-hydroxy$ acid from aldehydes:**

$$CH_3(H)C=O + HCN \xrightarrow{NaCN\ HCl} CH_3(H)C(OH)(CN)$$

$$CH_3(H)C(OH)(CN) + 2H_2O + H_2SO_4 \longrightarrow CH_3(H)C(OH)(COOH) + NH_4HSO_4$$

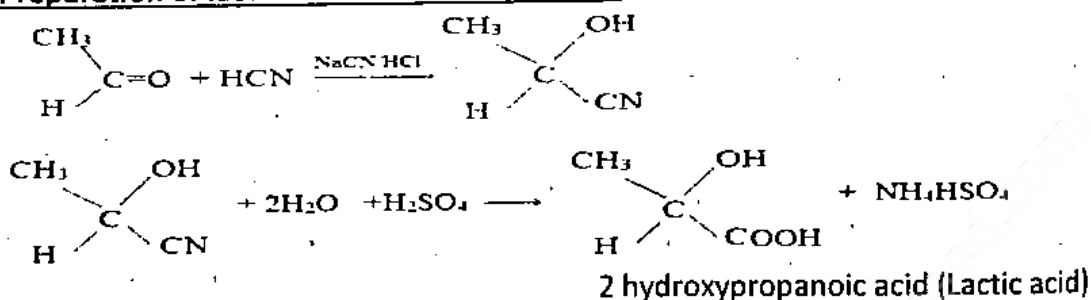
2 hydroxypropanoic acid (Lactic acid)

This reaction is used in the synthesis of α-hydroxy acids that contain one carbon atom more than the number of carbon atoms in the starting aldehydes or ketones.

17. Prepare lactic acid from acetaldehyde.

Ans: **Preparation of lactic acid from acetaldehyde:**

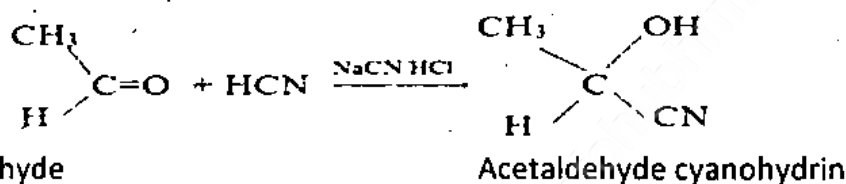
$$CH_3(H)C=O + HCN \xrightarrow{NaCN\ HCl} CH_3(H)C(OH)(CN)$$

$$CH_3(H)C(OH)(CN) + 2H_2O + H_2SO_4 \longrightarrow CH_3(H)C(OH)(COOH) + NH_4HSO_4$$

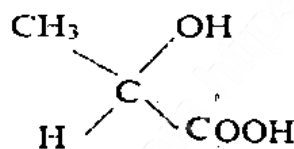
2 hydroxypropanoic acid (Lactic acid)

18. Give reaction of acetaldehyde with : HCN

Ans: **HCN:**

$$CH_3(H)C=O + HCN \xrightarrow{NaCN\ HCl} CH_3(H)C(OH)(CN)$$

Acetaldehyde — Acetaldehyde cyanohydrin

19. Draw the structure of Lactic Acid.

Ans: **Structure of Lactic Acid:**

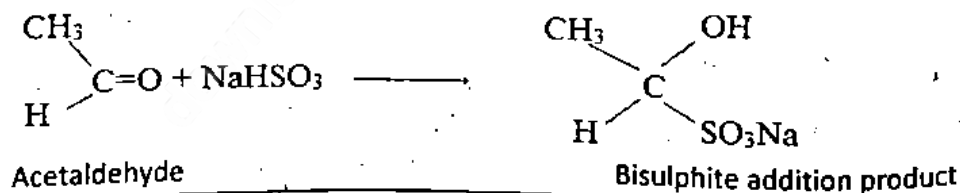
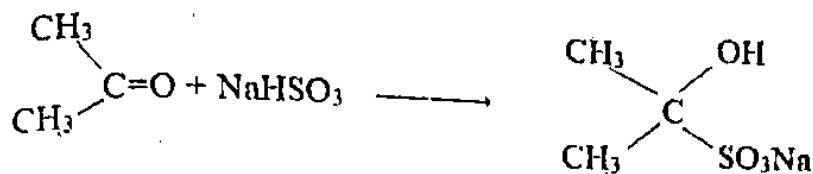
$$CH_3(H)C(OH)(COOH)$$

Topic No: 12.5.1/3

20 Write the mechanism of the addition of sodiumbisulphite to analdehyde.

Ans: **Mechanism of the addition of sodiumbisulphite to analdehyde:-**

$$CH_3(H)C=O + NaHSO_3 \longrightarrow CH_3(H)C(OH)(SO_3Na)$$

Acetaldehyde — Bisulphite addition product

$$(CH_3)_2C=O + NaHSO_3 \longrightarrow (CH_3)_2C(OH)SO_3Na$$

Acetone — Bisulphite addition sulphate

21 **Give mechanism of addition of HCN to acetaldyde.**

Ans:

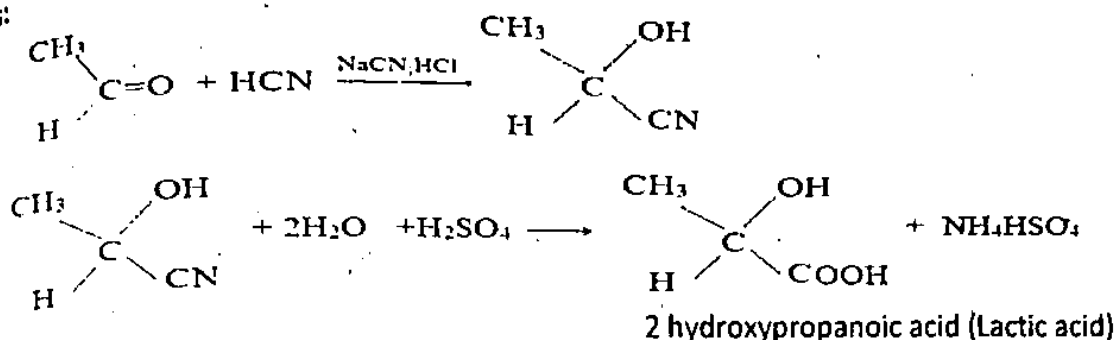
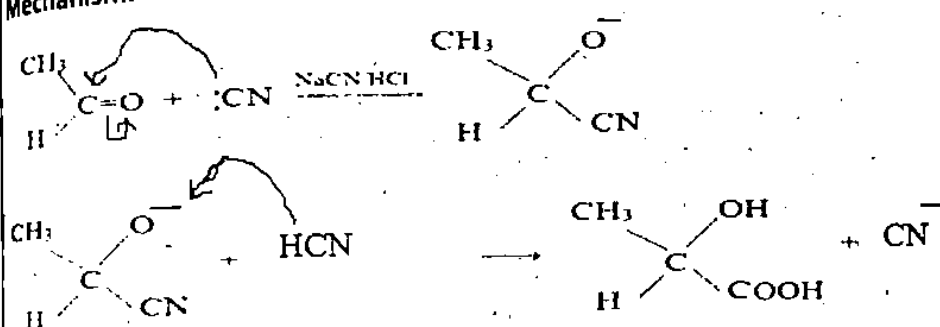
$$CH_3(H)C=O + HCN \xrightarrow{NaCN,HCl} CH_3(H)C(OH)CN$$

$$CH_3(H)C(OH)CN + 2H_2O + H_2SO_4 \longrightarrow CH_3(H)C(OH)COOH + NH_4HSO_4$$

2 hydroxypropanoic acid (Lactic acid)

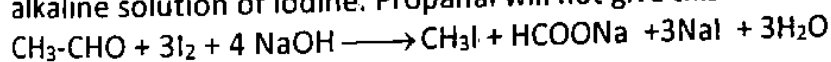
Mechanism:

$$CH_3(H)C=O + :\overline{C}N \xrightarrow{NaCN\ HCl} CH_3(H)C(\overline{O})CN$$

$$CH_3(H)C(\overline{O})CN + HCN \longrightarrow CH_3(H)C(OH)COOH + \overline{C}N$$

Topic No: 12.5.1/4

22 **How will you distinguish between ethanal and propanal?** **(2 times)**

Ans: **Ethanal and propanal:-** Ethanal forms yellow precipitate of iodoform with an alkaline solution of iodine. Propanal will not give this test.

$$CH_3\text{-}CHO + 3I_2 + 4\ NaOH \longrightarrow CH_3I + HCOONa + 3NaI + 3H_2O$$

23 **Define Aldol condensation?**

Ans: **Aldol condensation:-** Aldehydes and ketones possessing α-hydrogen atoms react with a cold dilute solution of an alkali to form addition products known as aldols. The name 'aldol' is given to the product because it contains both aldehyde and alcohol functional groups. In this process two molecules of the same carbonyl compound condense to form an aldol.

24 **How does acetaldehyde react with give reagents: (i)dilute NaOH (ii) NH_2OH** **(2 times)**

Ans: **(i)dilute NaOH :**

$$CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}H + CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}H \xrightarrow{dil\ NaOH} CH_3\text{-}\overset{OH}{\overset{|}{C}H}\text{-}CH_2\text{-}\overset{O}{\overset{\|}{C}}\text{-}H$$

Acetaldehyde Acetaldehyde — 3-hydroxybutanal

(ii) NH_2OH

$$CH_3(H)C=O + NH_2OH \xrightarrow{H^+} CH_3(H)C=N\text{-}OH + H_2O$$

Acetaldehyde — Ethanaloxime

25 **What is iodoform test? Illustrate with an example.** **(2 times)**

Ans: **Iodoform test:-** The haloform reaction using iodine and aqueous sodium hydroxide is called the iodoform test. It results in the formation of water

insoluble iodofrom which is a yallow solid. Iodoform test is used for distinguish methyl ketones from other ketones. It is also used to distinguish ethanol from methanol and other primary alcohols. It can be used to distinguish acetaldehyde from other aldehydes.

For Aectaldehyde:

$CH_3\text{-}CHO + 3I_2 + 4\ NaOH \longrightarrow CH_3I + HCOONa\ + 3NaI\ + 3H_2O$

Acetaldehye — Iodoform (yellow ppt) — sod.formate

For ethyl alcohol:

$CH_3\text{-}CH_2\text{-}OH + 4I_2 + 6NaOH \longrightarrow CH_3I + HCOONa\ + 5NaI\ + 5H_2O$

Ethyl alcohol — Iodoform — sod.formate

Topic No: 12.5.1/A

26 Describe briefly the mechanism of base catalyzed nucleophilic addition to a carbonyl compound? (3 times)

Ans: A base catalyzed nucleoopnilic addition reaction will take place with a strong nucleophilic reagent which has general mechanism as:

$$H{-}O^- + H{-}Nu \rightleftharpoons Nu^-: + HOH$$

$$Nu^-: + \;>C{=}O \rightleftharpoons Nu{-}\overset{|}{\underset{|}{C}}{-}O^-$$

$$Nu{-}\overset{|}{\underset{|}{C}}{-}O^- + H{-}OH \rightleftharpoons Nu{-}\overset{|}{\underset{|}{C}}{-}OH + OH^-$$

27 How iodoform is prepared from acetaldehyde and ethyl alcohol?(3 times)

Ans: **From Aectaldehyde:**

$CH_3\text{-}CHO + 3I_2 + 4\ NaOH \longrightarrow CH_3I + HCOONa\ + 3NaI\ + 3H_2O$

Acetaldehye — Iodoform (yellow ppt) — sod.formate

From ethyl alcohol:

$CH_3\text{-}CH_2\text{-}OH + 4I_2 + 6NaOH \longrightarrow CHI_3 + HCOONa\ + 5NaI\ + 5H_2O$

Ethyl alcohol — Iodoform — sod.formate

28 Explain why the aldehydes with no a-hydrogen give Cannizzaro's reaction? (2 times)

Ans: In the absence of α-hydrogen aldehyde consist of only one carbon atom in its molecule. The attacking nucleophile cannot attack on hydrogen rather it will attack on the carbon having partial positive charge. Reaction thus proceed follow Cannizzaro's mechanism rather than aldol condensation. Cannizzaro's reaction is a disproportionation (self oxidation and reduction) reaction. Two molecules of the aldehyde are involved, one molecule being converted into the corresponding alcohol (the reduced product) and the other into the acid in the salt form (the oxidation product).

29 Write down reactions of sodium bisulphate with acetaldehyde and acetone? / Give the mechanism of addition of sodium bisulphite to acetone.

Ans: **Reactions of sodium bisulphate with acetaldehyde and acetone:-**

$$(CH_3)(H)C{=}O + NaHSO_3 \longrightarrow (CH_3)(H)C(OH)(SO_3Na)$$

Acetaldehyde — Bisulphite addition product

$$(CH_3)_2C{=}O + NaHSO_3 \longrightarrow (CH_3)_2C(OH)(SO_3Na)$$

Acetone — Bisulphite addition sulphate

Topic No: 12.5.1/B

30 Give general mechanism of acid catalyzed addition reactions of aldehydes? (5 times)

Ans: **Mechanism of acid catalyzed addition reactions of aldehydes:-**

$$>C=O + H^+ \rightleftharpoons >C=O-H^+$$

$$Nu^- + >C=O-H^+ \rightleftharpoons Nu-\overset{|}{\underset{|}{C}}-OH$$

31 **How ethanal react with Phenyl Hydrazine? Give reaction.**

Ans: **Reaction of Ethanal with Phenyl Hydrazine:-**

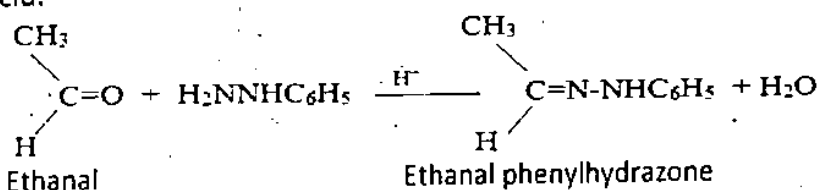
$$\underset{H}{\overset{CH_3}{>}}C=O + H_2NNHC_6H_5 \xrightarrow{H^+} \underset{H}{\overset{CH_3}{>}}C=N-NHC_6H_5 + H_2O$$

Ethanal — Ethanal phenylhydrazone

32 **How aldehyde reacts with hydrdzine? Give its mechanism**

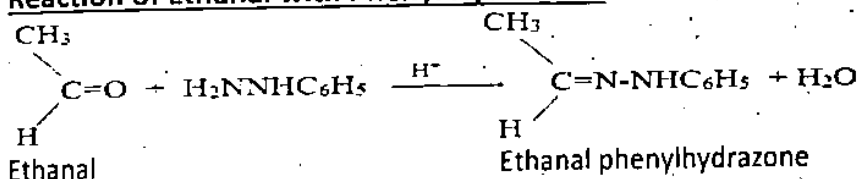
Ans: Aldehyde react with phenyl hydrazine to form phenylhydrazone in the presence of an acid.

$$\underset{H}{\overset{CH_3}{>}}C=O + H_2NNHC_6H_5 \xrightarrow{H^+} \underset{H}{\overset{CH_3}{>}}C=N-NHC_6H_5 + H_2O$$

Ethanal — Ethanal phenylhydrazone

33. **Write the reaction of phenyl hydrazine with acetaldehyde?**

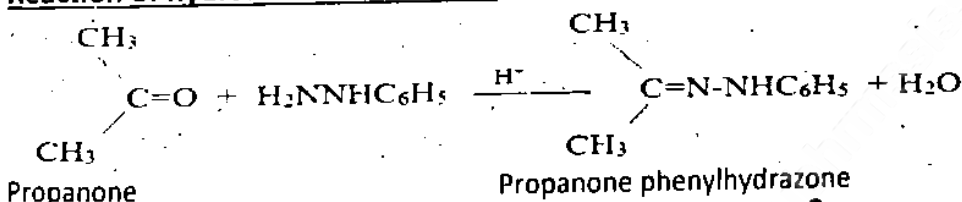
Ans: **Reaction of Ethanal with Phenyl Hydrazine:-**

$$\underset{H}{\overset{CH_3}{>}}C=O + H_2NNHC_6H_5 \xrightarrow{H^+} \underset{H}{\overset{CH_3}{>}}C=N-NHC_6H_5 + H_2O$$

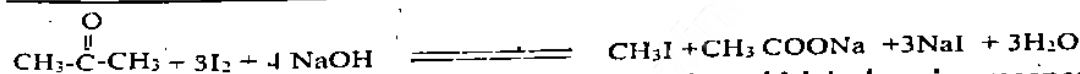
Ethanal — Ethanal phenylhydrazone

34. **How hydrazine reacts with acetone?**

Ans: **Reaction of hydrazine with acetone:**

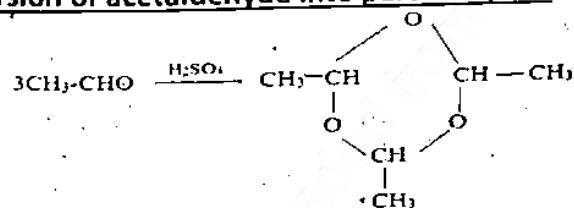
$$\underset{CH_3}{\overset{CH_3}{>}}C=O + H_2NNHC_6H_5 \xrightarrow{H^+} \underset{CH_3}{\overset{CH_3}{>}}C=N-NHC_6H_5 + H_2O$$

Propanone — Propanone phenylhydrazone

35 **Write the reaction of iodoform formation by using acetone?**

Ans: **Iodoform formation by using acetone:-**

$$CH_3-\overset{O}{\overset{||}{C}}-CH_3 + 3I_2 + 4\,NaOH \rightleftharpoons CH_3I + CH_3COONa + 3NaI + 3H_2O$$

36 **Convert acetaldehyde into paraldehyde by a reaction which is done in presence of dilute H_2SO_4?** **(3 times)**

Ans: **Conversion of acetaldehyde into paraldehyde:-**

$$3CH_3-CHO \xrightarrow{H_2SO_4} \text{(cyclic trimer: } CH_3-CH,\ CH-CH_3,\ CH-CH_3 \text{ joined by three O atoms)}$$

Paraldehyde

37 **Justify that Cannizzaro's reaction is self oxidation-reduction reaction? (4 times)**

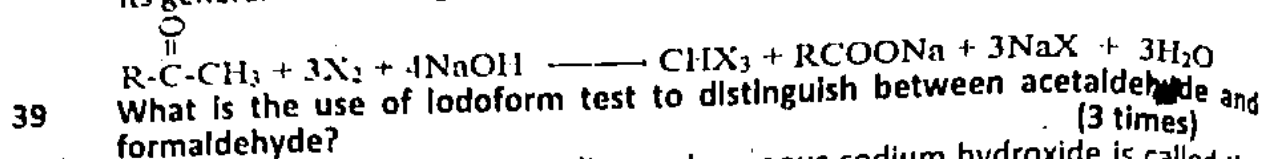
Ans: Cannizzaro's reaction is a disproportionation (self oxidation and reduction) reaction. Two molecules of the aldehyde are involved, one molecule being converted into the corresponding alcohol (the reduced product) and the other into the acid in the salt form (the oxidation product).

38 **What is haloform reaction?** **(4 times)**

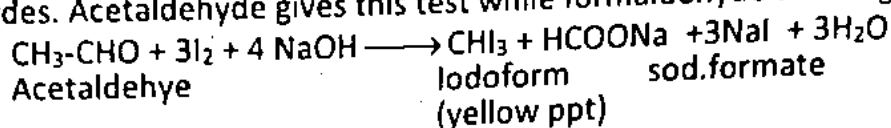
Ans: **Haloform reaction:-** Acetaldehyde and methyl ketones react with halogens in the presence of sodium hydroxide to give haloform, this reaction is called haloform reactions. The tem haloform is used for the reaction because a haloform (chloroform, bromoform or iodoform) is one of the product.

Its general reaction is give below:

$$R-\overset{O}{\overset{\|}{C}}-CH_3 + 3X_2 + 4NaOH \longrightarrow CHX_3 + RCOONa + 3NaX + 3H_2O$$

39 What is the use of iodoform test to distinguish between acetaldehyde and formaldehyde? **(3 times)**

Ans: The haloform reaction using iodine and aqueous sodium hydroxide is called the iodoform test. It results in the formation of water insoluble iodofrom which is a yallow solid. Iodoform test is used for distinguish acetaldehyde from other aldehydes. Acetaldehyde gives this test while formaldehyde do not give this test.

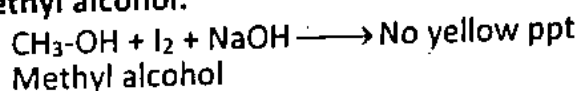
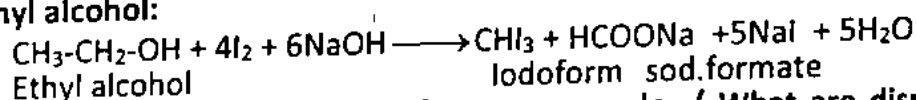
$$\underset{\text{Acetaldehye}}{CH_3-CHO} + 3I_2 + 4\,NaOH \longrightarrow \underset{\substack{\text{Iodoform}\\\text{(yellow ppt)}}}{CHI_3} + \underset{\text{sod.formate}}{HCOONa} + 3NaI + 3H_2O$$

$$HCHO + 3I_2 + 4\,NaOH \longrightarrow \text{No reaction}$$

40. Iodoform test can be used to distinguished between methyl alcohol and ethyl alcohol. Justify it? / Write applications of Iodoform test. / How would you differentiate between methanol and Ethanol? **(4 Times)**

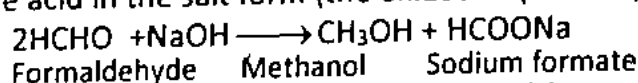
Ans: **For methyl alcohol:**

$$\underset{\text{Methyl alcohol}}{CH_3-OH} + I_2 + NaOH \longrightarrow \text{No yellow ppt}$$

For ethyl alcohol:

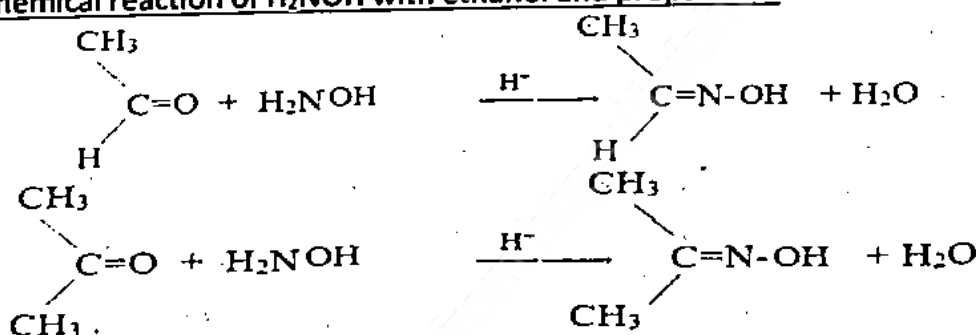
$$\underset{\text{Ethyl alcohol}}{CH_3-CH_2-OH} + 4I_2 + 6NaOH \longrightarrow \underset{\text{Iodoform}}{CHI_3} + \underset{\text{sod.formate}}{HCOONa} + 5NaI + 5H_2O$$

41 What is Cannizzaro,s reaction? Write one example. / What are disproportion reactions? Give one example. **(4 times)**

Ans: Aldehydes that have no α-hydrogen atoms undergo cannizzaro's reaction. Cannizzaro's reaction is a disproportionation (self oxidation and reduction) reaction. Two molecules of the aldehyde are involved, one molecule being converted into the corresponding alcohol (the reduced product) and the other into the acid in the salt form (the oxidation product).

$$\underset{\text{Formaldehyde}}{2HCHO} + NaOH \longrightarrow \underset{\text{Methanol}}{CH_3OH} + \underset{\text{Sodium formate}}{HCOONa}$$

42. Write chemical reaction of H_2NOH with ethanol & propanone in presence of acid

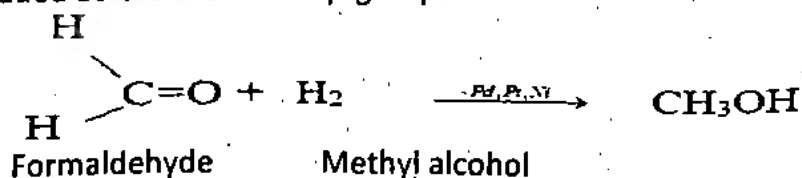
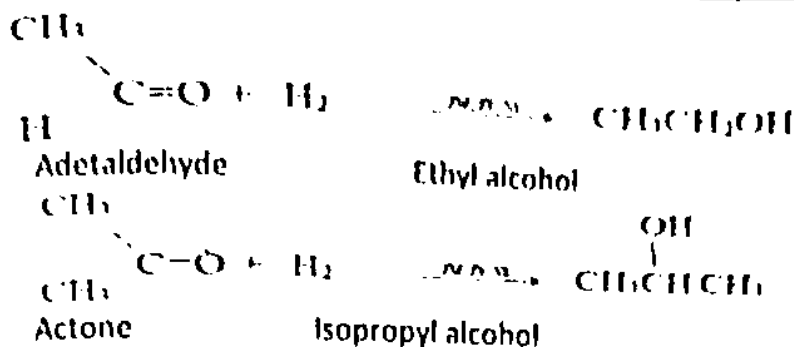
Ans: **Chemical reaction of H_2NOH with ethanol and propanone:**

$$(CH_3)(H)C=O + H_2NOH \xrightarrow{H^+} (CH_3)(H)C=N-OH + H_2O$$

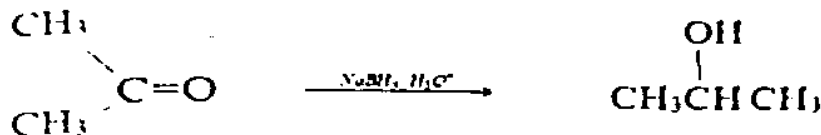
$$(CH_3)_2C=O + H_2NOH \xrightarrow{H^+} (CH_3)_2C=N-OH + H_2O$$

Topic No: 12.5.2

43 Which products are formed by the catalytic reduction of aldehydes? Gives one example.

Ans: Aldehyde and ketones on reduction with hydrogen in the presence of a metal catalyst like Pd, Pt or Ni from primary and secondary alcohols respectively. Hydrogen is added across the carbonyl group.

$$\underset{\text{Formaldehyde}}{(H)_2C=O} + H_2 \xrightarrow{Pd,\,Pt,\,Ni} \underset{\text{Methyl alcohol}}{CH_3OH}$$

44. Convert acetone into 2-propanol alcohol? (2 times)

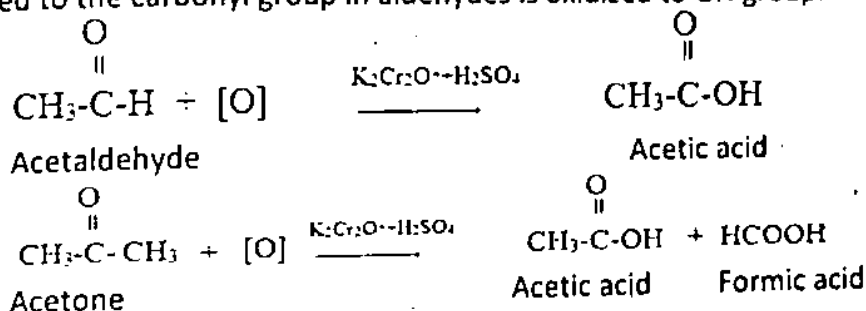
Ans: **Conversion of acetone into 2-propanol alcohol:**

$$CH_3COCH_3 \xrightarrow{NaBH_4,\ H_3O^+} CH_3CH(OH)CH_3$$

Topic No: 12.5.3

45. **How α-hydroxy acids are produced from aldehyde and ketones?(3 times)**

Ans: α-hydroxy acids are produced from aldehyde and ketones by oxidation process using strong oxidizing agents as $K_2Cr_2O_7/H_2SO_4$, $KMnO_4/H_2SO_4$. The oxygen atom attached to the carbonyl group in aldehydes is oxidized to OH group.

$$\underset{\text{Acetaldehyde}}{CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}H} + [O] \xrightarrow{K_2Cr_2O_7\text{-}H_2SO_4} \underset{\text{Acetic acid}}{CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}OH}$$

$$\underset{\text{Acetone}}{CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}CH_3} + [O] \xrightarrow{K_2Cr_2O_7\text{-}H_2SO_4} \underset{\text{Acetic acid}}{CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}OH} + \underset{\text{Formic acid}}{HCOOH}$$

Topic No: 12.6/1

46. **Distinguish between ethanol and propanone by a chemical test? (3 times)**

Ans: <u>Ethanol and propanone:-</u>Propanone is a ketone, it forms red precipitates with 2,4-DNPH (Dinitrophenyl hydrazine) solution while ethanol does not give this test. Porpanone will produce orange-red colour on adding alkaline sodium nitroprusside solution while ethanol does not give this test also.

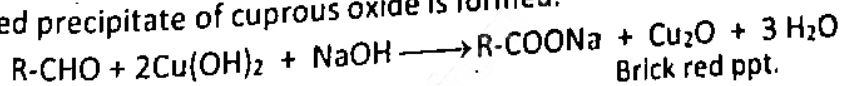
Topic No: 12.6/2

47. **What is sodium bisulphate test ?**

Ans: <u>Sodium bisulphate test:-</u>Aldehydes and small methyl ketones form a crystalline white precipitate with saturated sodium bisulphite solution.

48. **What is Benedict's solution test? Also give its reaction with acetaldehyde? (3 Times)**

Ans: <u>Benedict's solution test:</u>Aliphatic aldehydes form a brick red precipitate with Benedicts's solution . to an aldehyde solution, add Benedict's solution and boil. A brick red precipitate of cuprous oxide is formed.

$$R\text{-}CHO + 2Cu(OH)_2 + NaOH \longrightarrow R\text{-}COONa + \underset{\text{Brick red ppt.}}{Cu_2O} + 3H_2O$$

Topic No: 12.6/3

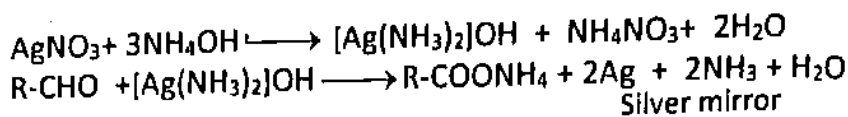
49. **Write the names of those weak oxidizing agents which can oxidize aldehyde but not the ketone? (3 Times)**

Ans: Tollen's reagent, Fehling' solution and Bendict's solution.

50. **Give chemical changes in two steps that occur by the addition of Tollen's Reagent to an aldehyde in a test tube and heated?**

Ans: Aldehyde form silver mirror with Tollen's reagent (ammonical silver nitrate solution). Add Tolllen's reagent to an aldehyde solution in a test tube and warm. A silver mirror is formed on the inside of the test tube.

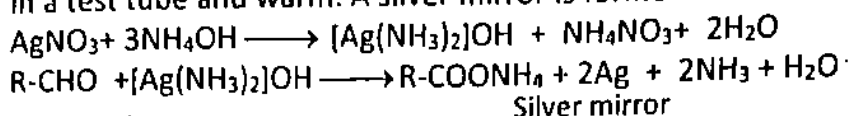
$AgNO_3 + 3NH_4OH \longrightarrow [Ag(NH_3)_2]OH + NH_4NO_3 + 2H_2O$

$R\text{-}CHO + [Ag(NH_3)_2]OH \longrightarrow R\text{-}COONH_4 + 2Ag + 2NH_3 + H_2O$

Silver mirror

51 What Is silver mirror test ? What Is its importance? (5 times)

Ans: **Silver mirror test:-** Aldehyde form silver mirror with Tollen's reagent (ammonical silver nitrate solution). Add Tolllen's reagent to an aldehyde solution in a test tube and warm. A silver mirror Is formed on the inside of the test tube.

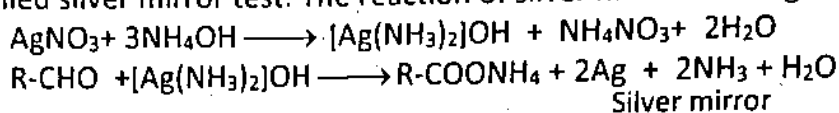
$AgNO_3 + 3NH_4OH \longrightarrow [Ag(NH_3)_2]OH + NH_4NO_3 + 2H_2O$

$R\text{-}CHO + [Ag(NH_3)_2]OH \longrightarrow R\text{-}COONH_4 + 2Ag + 2NH_3 + H_2O$

Silver mirror

52 Tollen's test is also called Silver mirror test . Justify it. (2 times)

Ans: Aldehyde form silver mirror with Tollen's reagent (ammonical silver nitrate solution). Add Tolllen's reagent to an aldehyde solution in a test tube and warm. A silver mirror is formed on the inside of the test tube. Therefore, Tollen's test also called silver mirror test. The reaction of silver mirror test is given below as:

$AgNO_3 + 3NH_4OH \longrightarrow [Ag(NH_3)_2]OH + NH_4NO_3 + 2H_2O$

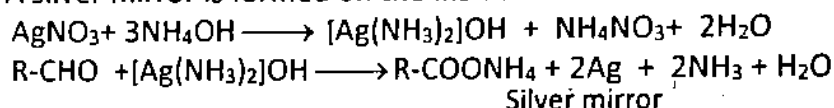
$R\text{-}CHO + [Ag(NH_3)_2]OH \longrightarrow R\text{-}COONH_4 + 2Ag + 2NH_3 + H_2O$

Silver mirror

53. What is Tollen's test? (4 times)

Ans: **Tollen's test:**Aldehyde form silver mirror with Tollen's reagent (ammonical silver nitrate solution). Add Tolllen's reagent to an aldehyde solution in a test tube and warm. A silver mirror is formed on the inside of the test tube.

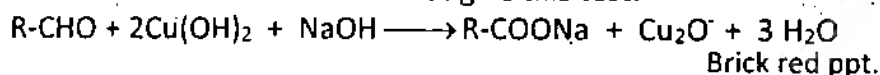
$AgNO_3 + 3NH_4OH \longrightarrow [Ag(NH_3)_2]OH + NH_4NO_3 + 2H_2O$

$R\text{-}CHO + [Ag(NH_3)_2]OH \longrightarrow R\text{-}COONH_4 + 2Ag + 2NH_3 + H_2O$

Silver mirror

Topic No: 12.6/4

54 Fehling's solution reacts with aldehydes to give red ppt. Justify it. (4 times)

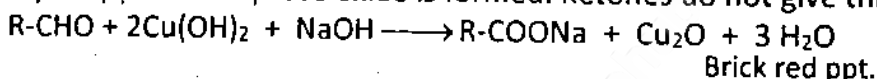
Ans: Aliphatic aldehydes form a brick-red precipitate with Fehling's solution. To an aldehyde solution, add Fehling's solution and boil. A brick red precipitate of cuprous oxide is formed. Ketones do not give this test.

$R\text{-}CHO + 2Cu(OH)_2 + NaOH \longrightarrow R\text{-}COONa + Cu_2O + 3H_2O$

Brick red ppt.

55 Write Fehling's solution test? (9 times)

Ans: **Fehling's solution test:-**Aliphatic aldehydes form a brick-red precipitate with Fehling's solution. To an aldehyde solution, add Fehling's solution and boil. A brick red precipitate of cuprous oxide is formed. Ketones do not give this test.

$R\text{-}CHO + 2Cu(OH)_2 + NaOH \longrightarrow R\text{-}COONa + Cu_2O + 3H_2O$

Brick red ppt.

Topic No: 12.6.6

56 What is sodium nitroprusside test? (3 times)

Ans: Ketones produce a wine red or orange red colour on adding alkaline sodium nitroprusside solution dropwise. Aldehyde don't give this test.

Topic No: 12.7

57 Write down four uses of acetaldehyde? (9 times)

Ans:
(i).. It is used to make acetaldehyde ammonia used as a rubber –accelerator.
(ii).. It is used as an antiseptic inhalant in nasal infections.
(iii).. It isused in silvering of mirrors.
(iv).. It is used to make phenolic resins and synthetic drugs.

58 What is Formalin? / What is the composition of formalin? (3 times)

Ans: **Formalin:-**Methyl alcohol is oxidized to gaseous formaldehyde which is absorbed in water. The resulting mixture is called formalin. Formalin is a mixture of 40% formaldehyde , 8% methyl alcohol and 52% water.

59 Give any two uses of formaldehyde and any two uses of acetaldehyde?

Ans: **Uses of formaldehyde**(i).. It is used as decolouring agent in vat dyeing.
(ii).. It is used in the silvering of mirrors.
(iii).. It is used in making medicine urotropine used as a urinary antiseptic.

(iv).. It is used in the processing of anti-poliovaccine.

Uses of acetaldehyde

(i).. It is used to make acetaldehyde ammonia used as a rubber –accelerator.
(ii).. It is used as an antiseptic inhalant in nasal infections.
(iii).. It isused in silvering of mirrors.
(iv).. It is used to make phenolic resins and synthetic drugs.

60 Write four uses of formaldehyde? **(10 times)**

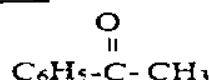
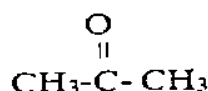
Ans: (i).. It is used as decolouring agent in vat dyeing.
(ii).. It is used in the silvering of mirrors.
(iii).. It is used in making medicine urotropine used as a urinary antiseptic.
(iv).. It is used in the processing of anti-poliovaccine.

61 Write down the formulas of the following :(i)Acetophenone (ii) Acetone

Ans: **(i)Acetophenone:**

$$C_6H_5-\overset{O}{\overset{\|}{C}}-CH_3$$

(ii) Acetone:

$$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$$

62. Give formulas of formaldehyde and acetaldehyde.

Ans: Formulaof formaldehyde : $HCHO$
Formulas of acetaldehyde : CH_3CHO

63 How will you distinguish between acetaldehyde and benzaldehyde?

Ans: Acetaldehyde is an aldehyde having α-hydrogen atom which react with a cold dilute solution of an alkali to form product known as aldol. While benzaldehyde is an aldehyde having no α- hydrogen atom so under which react with a cold dilute solution of an alkali to form product known as Cannizzaro's product.

64 Write chemical formulas of hydroxylamine and phenyl hydrazine.

Ans: Chemical formulas of hydroxylamine: NH_2OH
Chemical formulas of phenyl hydrazine: $C_6H_5NHNH_2$

2018

65. How does an aldehyde react with (a) Hydroxylamine (b) Hydrazine

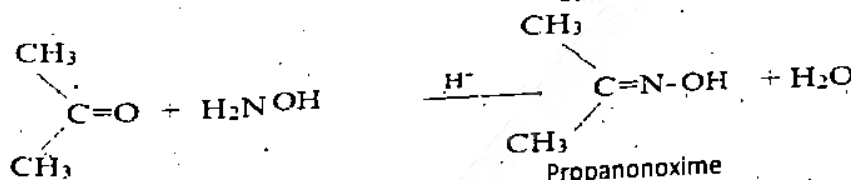
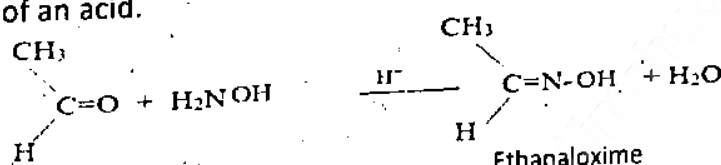
Ans: **Reactions of aldehyde:**

(a) Hydroxylamine: Aldehyde reacts with hydroxylamine to form oximes in the presence of an acid.

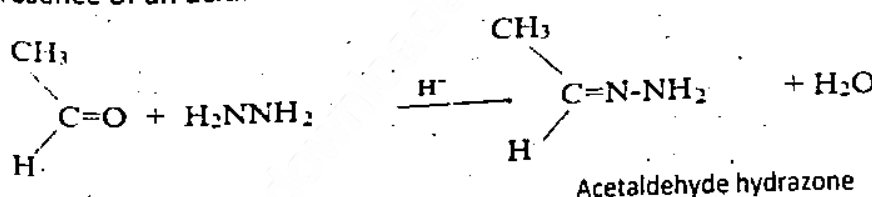
$$(CH_3)(H)C=O + H_2NOH \xrightarrow{H^+} (CH_3)(H)C=N-OH + H_2O$$

Ethanaloxime

$$(CH_3)_2C=O + H_2NOH \xrightarrow{H^+} (CH_3)_2C=N-OH + H_2O$$

Propanonoxime

(b) Hydrazine: Aldehyde reacts with hydrazine to form hydrazones in the presence of an acid.

$$(CH_3)(H)C=O + H_2NNH_2 \xrightarrow{H^+} (CH_3)(H)C=N-NH_2 + H_2O$$

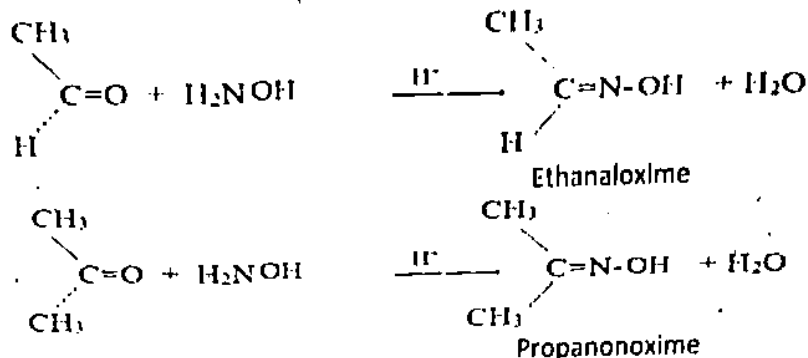
Acetaldehyde hydrazone

66. Write equation for the reactions of hydroxylamine with ethanal and acetone?

Ans: **Equations:**

$$CH_3-CHO + H_2NOH \xrightarrow{H^+} CH_3(H)C=N-OH + H_2O$$

Ethanaloxime

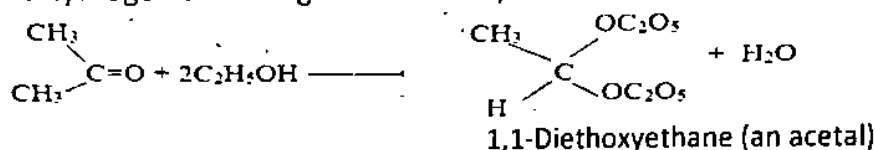
$$(CH_3)_2C=O + H_2NOH \xrightarrow{H^+} (CH_3)_2C=N-OH + H_2O$$

Propanonoxime

67. Write a reaction which is used to protect aldehyde group against alkaline oxidizing agent?

Ans: <u>**Reaction to protect aldehyde group:**</u>

Acetaldehyde combine with alcohols in the presence of hydrogen chloride gas to form acetals. The hydrogen chloride gas acts as a catalyst. Both the alcohol and the hydrogen chloride gas must be dry.

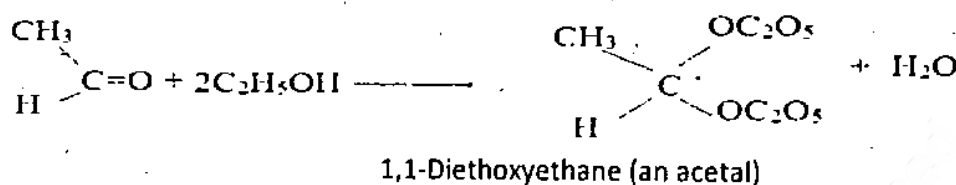
$$(CH_3)(CH_3)C=O + 2C_2H_5OH \longrightarrow CH_3(H)C(OC_2O_5)_2 + H_2O$$

1,1-Diethoxyethane (an acetal)

This reaction is used to protect the aldehyde group against alkaline oxidizing agent.

68. Give reaction of aldehyde with alcohol to produce hemi acetal and acetal.

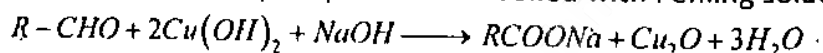
Ans:

$$CH_3(H)C=O + 2C_2H_5OH \longrightarrow CH_3(H)C(OC_2O_5)_2 + H_2O$$

1,1-Diethoxyethane (an acetal)

2019

69. Write Fehling's solutions test.

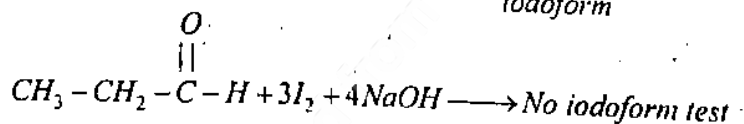
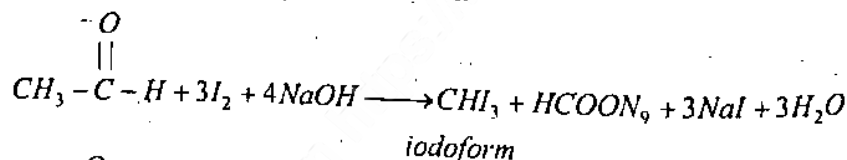
Ans: Aliphatic aldehydes give brick red precipitate when boiled with Fehling solution.

$$R-CHO+2Cu(OH)_2+NaOH \longrightarrow RCOONa+Cu_2O+3H_2O$$

Ketones do not give this test

70. Distinguish between ethanol and propanol.

Ans: Ethanol gives iodoform test but propanal can not.

$$CH_3-\overset{\overset{O}{||}}{C}-H+3I_2+4NaOH \longrightarrow \underset{iodoform}{CHI_3}+HCOON_9+3NaI+3H_2O$$

$$CH_3-CH_2-\overset{\overset{O}{||}}{C}-H+3I_2+4NaOH \longrightarrow No\ iodoform\ test$$

71. Distinguish Chemically between "Acetone" and "Ethyl alcohol".

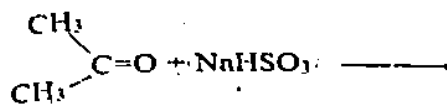
Ans: We use sodium nitroprusside test for this purpose.

Acetone would produce a wine red colour with alkaline sodium nitroprusside solution while no such colour is produced with Ethyl alcohol.

2021

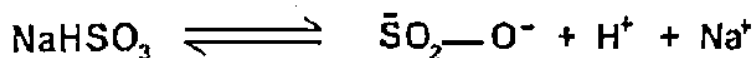
72. How $NaHSO_3$ is added to acetone, give mechanism.

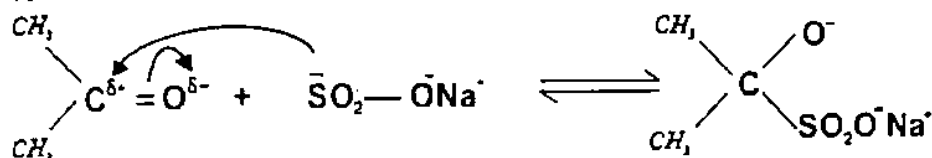
Ans:

$$\begin{matrix} CH_3 \\ CH_3 \end{matrix} \!\!> C{=}O + NaHSO_3 \longrightarrow \begin{matrix} CH_3 & & OH \\ & C & \\ CH_3 & & SO_3Na \end{matrix}$$

Acetone — Bisulphite addition sulphate

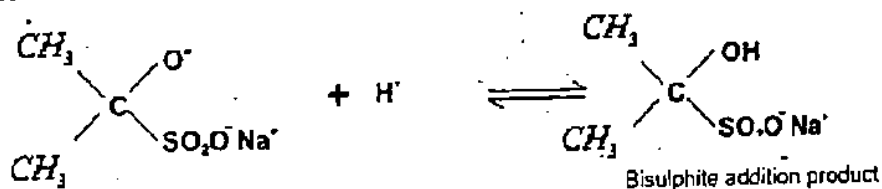
Mechanism:

Sodium bisulphite ionises to form sulphite ions.

$$NaHSO_3 \rightleftharpoons \bar{S}O_2{-}O^- + H^+ + Na^+$$

The sulphite ion acts as a nucleophile, since the sulphur atom is more nucleophilic than oxygen, a C—S bond is formed.

$$\begin{matrix} CH_3 \\ CH_3 \end{matrix} \!\!> C^{\delta+} = O^{\delta-} + \bar{S}O_2{-}\bar{O}Na^+ \rightleftharpoons \begin{matrix} CH_3 & & O^- \\ & C & \\ CH_3 & & SO_2O^-Na^+ \end{matrix}$$

Proton is attached to the negatively charged oxygen atom to form bisulphite addition product.

$$\begin{matrix} CH_3 & & O^- \\ & C & \\ CH_3 & & SO_2O^-Na^+ \end{matrix} + H^+ \rightleftharpoons \begin{matrix} CH_3 & & OH \\ & C & \\ CH_3 & & SO_2O^-Na^+ \end{matrix}$$

Bisulphite addition product

Ketones in which both alkyl groups are larger than methyl do not react with sodium bisulphite

73. Write equations for the reactions of Acetaldehyde with:

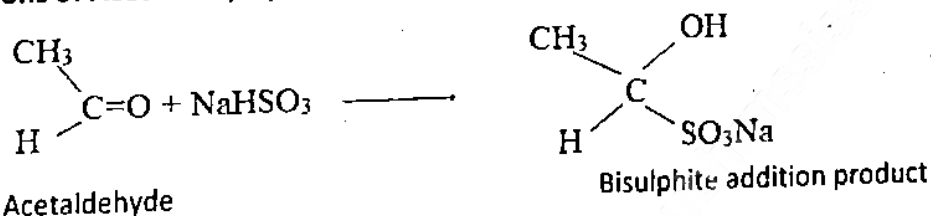
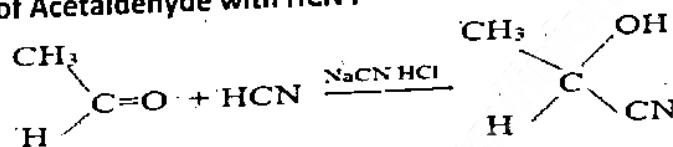
(a) $NaHSO_3$ (b) HCN

Ans: (a) Reactions of Acetaldehyde with $NaHSO_3$:

$$\begin{matrix} CH_3 \\ H \end{matrix} \!\!> C{=}O + NaHSO_3 \longrightarrow \begin{matrix} CH_3 & & OH \\ & C & \\ H & & SO_3Na \end{matrix}$$

Acetaldehyde — Bisulphite addition product

(b) Reactions of Acetaldehyde with HCN :

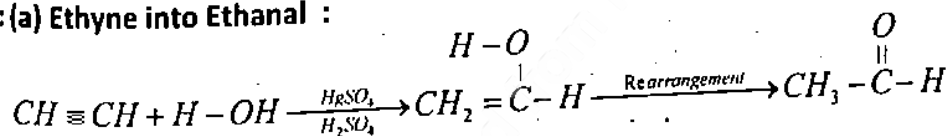
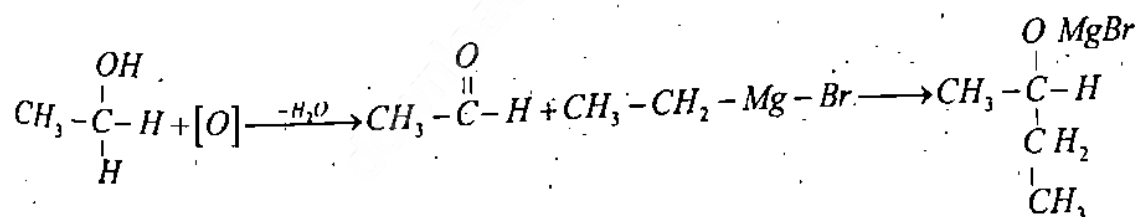
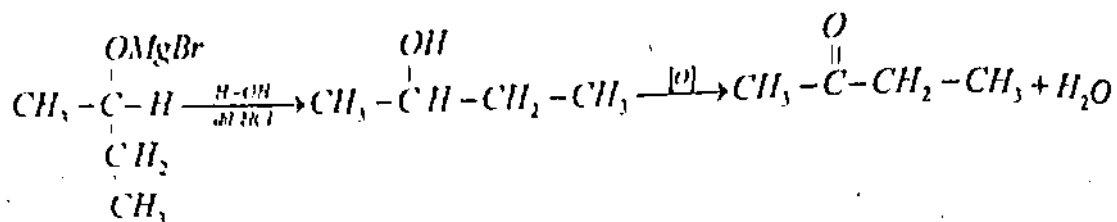
$$\begin{matrix} CH_3 \\ H \end{matrix} \!\!> C{=}O + HCN \xrightarrow{NaCN\ HCl} \begin{matrix} CH_3 & & OH \\ & C & \\ H & & CN \end{matrix}$$

74. How will you convert: (a) Ethyne into Ethanal (b) Ethanol into 2-Butanone.

Ans: (a) Ethyne into Ethanal :

$$CH \equiv CH + H-OH \xrightarrow[H_2SO_4]{HgSO_4} CH_2 = \overset{\overset{H-O}{|}}{C} - H \xrightarrow{Rearrangement} CH_3 - \overset{\overset{O}{||}}{C} - H$$

(b) Ethanol into 2-Butanone:

$$CH_3 - \overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}} - H + [O] \xrightarrow{-H_2O} CH_3 - \overset{\overset{O}{||}}{C} - H + CH_3 - CH_2 - Mg - Br \longrightarrow CH_3 - \overset{\overset{O\,MgBr}{|}}{\underset{\underset{\underset{CH_3}{|}}{CH_2}}{C}} - H$$

$$CH_3-\underset{\underset{CH_3}{|}{\underset{|}{CH_2}}}{\overset{OMgBr}{\overset{|}{C}}}-H \xrightarrow[-MgBrCl]{H-OH} CH_3-\overset{OH}{\overset{|}{C}}H-CH_2-CH_3 \xrightarrow{[O]} CH_3-\overset{O}{\overset{||}{C}}-CH_2-CH_3+H_2O$$

CHAPTER NO:12 LONG QUESTIONS
ALDEHYDE AND KETONES
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 12.3

1. Prepare Acetaldehyde from: (i) Calcium Acetate ii) Ethyl Alcohol

Ans: (Text Book Page No:231)

2. Write laboratory and Industrial preparation for Acetaldehyde. (2 times)

Ans: (Text Book Page No:231)

3. Describe the laboratory method of preparation of formaldehyde with diagram. (2 times)

Ans: (Text Book Page No:230)

Topic No: 12.5.1

4. How does formaldehyde reacts with the following reagents?
   i)HCN ii) $NaHSO_3$ iii) $NaBH_4$ / H_2O iv) Conc. NaOH

Ans: (Text Book Page No:242)

5. Discuss reactions of ethanol & propanone with: i) Hydroxylamine ii) Phenyl hydrazine

Ans: (Text Book Page No:240)

6. Write the reactions of ethanal with: (i) HCN (ii) $NAHSO_3$ (iii) H_2NOH (iv) H_2NNH_2

Ans: (Text Book Page No:233)

Topic No: 12.5.1/b-2

7. Write the reaction mechanism of an aldehyde with an ammonia derivative.

Ans: (Text Book Page No:240)

8. Give reactions of acetone & acetaldehyde with:i) Hydroxyl amino ii) Hydrazine

Ans: (Text Book Page No:240)

9. Explain the mechanism of reaction of phenylhydrazine with Acetone.(2 times)

Ans: (Text Book Page No:240)

Topic No: 12.5.1/4

10. Define aldol condensation. Give its mechanism. (9 times)

Ans: (Text Book Page No:235)

Topic No: 12.5.1/5

11. Define Cannizaro's reaction. Explain its mechanism with a suitable example. (10 times)

Ans: (Text Book Page No:237)

Topic No: 12.5.2

12. Discuss reduction of carbonyl compounds with sodium borohydribde with proper mechanism.

Ans: (Text Book Page No:242)

Topic No: 12.5.3

13. Why oxidation of ketones does not occur easily? What strong oxidizing agent is used to oxidize ketones.
Ans: (Text Book Page No:244) (2 Times)

Topic No: 12.6

14. Discuss Haloform reactions with one example.
Ans: (Text Book Page No:238) (2 times)
15. Write the chemical equation involved in Tollen's and Fehling's solution tests. Give colour of precipitates formed in each case. Why
Ans: (Text Book Page No:244)
16. Tollen's test is also known as silver mirror test.
Ans: (Text Book Page No:244)
17. Describe various tests for identification of carbonyl compounds. (3 Times)
Ans: (Text Book Page No:241)
18. Discuss oxidation of aldehyde with : (i) $K_2Cr_2O_7 / H_2SO_4$ (ii) Tollen's reagent.
Ans: (Text Book Page No:243)
19. Write four tests by which aldehydes can be distinguished from ketones. (2 times)
Ans: (Text Book Page No:239)

Topic No: 12.7

20. Write any four uses of acetaldehyde. (2 times)
Ans: (Text Book Page No:245)
21. Convert the following:i) Propyne into acetone ii) Ethyne into oxalic acid
22. Distinguish between (i) Butanone & 3-pentanone (ii)Acetaldehyde & benzaldehyde
23. Prepare Acetaldehyde cyanohydrine from acetaldehyde and then convert in into 2-hydroxypropanoic acid.
Ans: (Text Book Page No:233)
24. Write equations for the reactions of Acetaldehyde with.
(i) HCN (ii) $CH_3 - CH_2 - MgBr$ (iii) $I_2/NaOH$ (iv) $NH_2 - NH - C_6H_5$
Ans: (Text Book Page No:238)
25. How does acetaldehyde react with following reagents. (3 Times)
(i) C_2H_5MgI (ii) HCN (iii) $NaHSO_3$ (iv) $I_2 / NaOH$
Ans: (Text Book Page No:234)
26. By using propanone as a starting material, how would you get?
i) acetic acid ii) isoprophl alcohol
Ans: (Text Book Page No:244)

2018

27. Write a note on oxidation of aldehydes and ketones.
Ans: (Text Book Page No:243)
28. Explain mechanism of addition of sodium bisulphate to acetone? What is the utility of this reaction.

2021

29. Write down any eight uses of formaldehyde.
30. Describe with mechanism Aldol condensation reaction. Why Formaldehyde does not give this reaction?
31. What types of Aldehydes give Cannizzaro's reaction? Give its mechanism.
32. Explain with Mechanism the addition of Sodium Bisulphite to Acetone . What is the utility of this reaction?
33. How does acetone react with HCN and give it's reaction mechanism?

CHAPTER NO:13 CARBOXYLIC ACIDS
OBJECTIVES (MCQ'S)
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 13.1

1. Which of the following is not a fatty acid? **(9 times)**
(a) Propionic acid (b) Acetic acid (c) Phthalic acid (d) Butanoic acid

2. Which of the following is not a fatty acid? **(2 times)**
(a) Carboxylic acid (b) Glutamic acid (c) Aspartic acid (d) Phthalic acid

Topic No: 13.3

3. Acetic acid is manufactured by: **(10 times)**
(a) Distillation (b) Fermentation (c) Ozonalysis (d) Esterification

4. Ethanol can be converted into ethanoic acid by: **(2 Times)**
(a) Hydrogenation (b) Hydration (c) Oxidation (d) Fermentation

5. An Aqueous Solution of an organic compound reacts with Na_2CO_3 to produce CO_2 Gas. Which one of the following could be the Organic Compound? **(2 times)**
(A) $CH_2 = CH-CH_3$ (B) $CH_3 - CHO$ (C) $CH_3COOC_2H_5$ (D) CH_3-CH_2-COOH

Topic No: 13.4

6. A cyclic dimer of acetic acid is formed when it is added to benzene. The number of oxygen atoms in a dimer ring is/are:
(a) One (b) two (c) four (d) six

7. Which one has the higher boiling point?
(a) $HCOOH$ (b) CH_3COOH (c) C_2H_5COOH (d) $CH_3-CH_2-CH_2COOH$

8. Among the Aliphatic Carboxylic Acids first four members are Soluble in water due to:
(A) London Dispersion Forces (B) Hydrogen Bonding
(C) Ion – Dipole Forces (D) Covalent Bond

Topic No: 13.5

9- One of the following organic compound react with Sodium Bicarbonate to produce CO_2 gas:
(a) CH_3COOH (b) $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ (c) $CH_3 - CH_2 - OH$ (d) CH_3COCH_3

Topic No: 13.6

10. Which of the following reagent is used to reduce carboxylic group to alcohol? **(14 times)**
(a) N_2/Ni (b) H_2/Pi (c) $NaBH_4$ (d) $LiAlH_4$

11. The reagent used to convert carboxylic directly to alkane is: **(3 times)**
(a) HI/P (b) $NaBH_4$ (c) $LiAlH_4$ (d) H_2/Ni

12. Which derivative cannot be prepared directly from acetic acid? **(6 times)**
(a) Acetamide (b) Acetyl chloride (c) Acetic anhydride (d) Ethyl acetate

13. The flavour of Benzyl acetate is: **(2 times)**
(a) Orange (b) Apricot (c) Banana (d) Jasmine

14- Acetamide is prepared by: **(2 times)**
(A) heating ammonium acetate (B) heating methyl cyanide
(C) heating ethyl acetate (D) the hydrolysis of methyl cyanide

15- Which of the following esters has orange flavour:
(A) Amyl acetate (B) Benzyl acetate (C) Amyl butyrate (D) Octyl acetate

Topic No: 13.7

16. The compound used in the manufacture of synthetic fiber is: **(7 times)**
(a) Formic acid (b) Acetic acid (c) Oxalic acid (d) Carbonic acid

17. **The solution of the acid used for seasoning of food is:** **(13 times)**
(a) Formic acid (b) Acetic acid (c) Benzonic acid (d) Butanonic acid

18. **The flavour of amyl acetate is:**
(a) Orange (b) Apricot (c) Banana (d) Pine apple

Topic No: 13.7.3

19. **Molar mass of CH_3COOH obtained by elevation of boiling point method is:**
(a) 30 (b) 60 (c) 120 (d) 180

Topic No: 13.7.5

20. **Which acid is used in the manufacture of synthetic fiber?** **(8 times)**
(a) Formic acid (b) Oxalic acid (c) Carbonic acid (d) Acetic acid

Topic No: 13.8

21. **Which one is neutral amino acid:** **(2 times)**
(a) Lysine (b) Histidine (c) Valine (d) Glutamic acid

22. **Which of the following elements is not present in all proteins:** **(6 times)**
(a) carbon (b) hydrogen (c) nitrogen (d) sulphur

2018

23. **Acetamide is prepared by heating:**
(a) ammonium acetate (b) methyl cyanide (c) phthalic acid (d) ethyl acetate

24. **Which is basic amino acid:**
(a) Glycine (b) Alanine (c) Aspartic acid (d) Lysine

2019

25. **Which enzyme is not involved in fermentation of starch:**
(a) Urease (b) Zymase (c) Invertase (d) Diastase

26. **Chemical formula of glycine is?**
(a) H_3CCOOH (b) $H_3C.CHO$ (c) $H_2N.CH_2COOH$ (d) $H_3C.CO.CH_3$

27. **Origin of Formic Acid is:**
(a) Milk (b) Butter (c) Red Ants (d) Oil

2021

28. **The flavour of Octylacetate is :**
(a) Orange (b) Apricot (c) Banana (d) Jasmine

29. **Carboxylic acids on reduction with HI and red phosphorus gives:**
(a) Alkanes (b) Alcohols (c) Aldehydes (d) Ketones

30. **Alkane nitrile can be converted into carboxylic acids by:**
(a) Hydration (b) Acidic hydrolysis (c) Hydrogenation (d) Oxidation

31. **A carboxylic acid contains:**
(a) A carboxylic group (b) A hydroxyl group (c) Alcoholic group (d) Keto group

32. **Which one of these is the formula of Palmitic Acid:**
(a) $C_{15}H_{31}COOH$ (b) $C_{16}H_{31}COOH$ (c) $C_{17}H_{35}COOH$ (d) $C_{18}H_{37}COOH$

33. **Which of the following ester gives apricot flavour?**
(a) Amyl acetate (b) Benzyl acetate (c) Amyl butyrate (d) Otyl acetate

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13
C	D	B	C	D	C	D	B	A	D	A	A	D
14	15	16	17	18	19	20	21	22	23	24	25	26
A	D	B	B	C	B	D	C	D	A	D	A	C
27	28	29	30	31	32	33						
C	A	A	B	A	A	C						

CHAPTER NO:13 CARBOXYLIC ACIDS
SHORT QUESTION'S OF CHAPTER-13
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 13.1

1 What are Aliphatic and aromatic carboxylic acids? Give one example?

Ans: **Aliphatic and aromatic carboxylic acids:-**

The carboxylic acid, in which $-\overset{O}{\overset{\|}{C}}-OH$ is attached to alkyl group (or a hydrogen atom) is called aliphatic carboxylic acid.

$R-\overset{O}{\overset{\|}{C}}-OH$ where R is alkyl group or a hydrogen atom

The carboxylic acid, in which $-\overset{O}{\overset{\|}{C}}-OH$ is attached to aryl group is called aliphatic carboxylic acid.

$Ar-\overset{O}{\overset{\|}{C}}-OH$ where R is phenyl or aryl group

2 What are carbocyclic compounds?

Ans: **Carbocyclic compounds:-** Organic compounds containing (–COOH) as a functional group are called carboxylic compounds. The (–COOH) group which itself is make up of a (> C=O) and a hydroxyl group (–OH).

3 Write down structural formulae of pthalic acid and malonic acid? (5 times)

Ans: **Structural formulae of pthalic acid and malonic acid:-**

Phthalic acid Malonic acid

4 What are fatty acids? Give one example. (2 Times)

Ans: The aliphatic monocarboxylic acids are commonly called fatty acids because higher members of this series such as palmitic acid ($C_{15}H_{31}COOH$), stearic acid ($C_{17}H_{35}COOH$), etc. are obtained by the hydrolysis of fats or oils.

Topic No: 13.3.1

5. How Acetic Acid is prepared by the oxidation of ethyl Alcohol?

Ans: **Preparation of Acetic Acid by the oxidation of ethyl Alcohol:**

$$CH_3-CH_2-OH+[O]\xrightarrow{K_2Cr_2O_7,H_2SO_4}CH_3-\overset{O}{\overset{\|}{C}}-H\xrightarrow{K_2Cr_2O_7,H_2SO_4}CH_3COOH$$

Ethyl alcohol Acetaldehyde Acetic acid

Topic No: 13.2

6 Write down formula for : (a) palmitic acid (b) strearic acid (2 Times)

Ans: (a).. Formula of palmitic acid is: $C_{15}H_{31}COOH$

(b).. Formula of strearic acid is: $C_{17}H_{35}COOH$

Topic No: 13.3

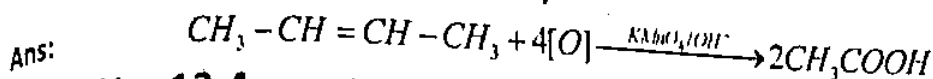
7 How hydrolysis of ester leads the formation of acetic acid?

Ans: The ester on boiling with concentrated sodium hydroxide yields sodium salt of the acid. This resulting salt when treated with dilute HCl gives the free carboxylic acid.

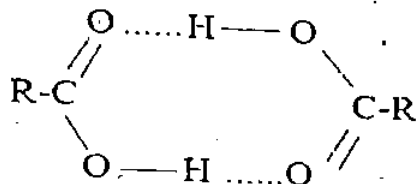
$$R\text{-}COOR + NaOH \longrightarrow R\text{-}COONa + R\text{-}OH$$

$$R\text{-}COONa + HCl \longrightarrow R\text{-}COOH + NaCl$$

8. **How acetic acid is prepared by the oxidation cleavage of 2-butene? / Explain oxidative cleavage of alkene briefly.** **(3 times)**

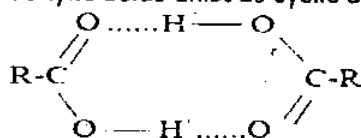
Ans: $$CH_3-CH=CH-CH_3+4[O]\xrightarrow{KMnO_4/OH^-}2CH_3COOH$$

Topic No: 13.4

9 **Drawdimerofacarboxylic acid?**

Ans: Dimer of a carboxylic acid:-

10. **Give trend of solubility of carboxylic acids in water.**

Ans: Among the aliphatic acids, the first four members are very soluble in water due to hydrogen bonding. The solubility in water gradually decreases with the increase in molecular mass.

11. **Why B.P(boiling point)of carboxylic acid are relatively high?** **(2 Times)**

Ans: The boiling point of carboxylic acids are relatively high due to intermolecular hydrogen bonding. The molecular mass determination in non - polar solvents like benzene shows that carboxylic acids exist as cyclic dimers.

12. **Why Carboxylic Acids are soluble in water? Give example.**

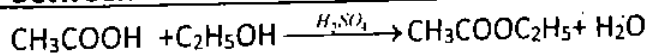
Ans: The carboxylic acids are soluble in water due to hydrogen bonding.

Topic No: 13.6/a

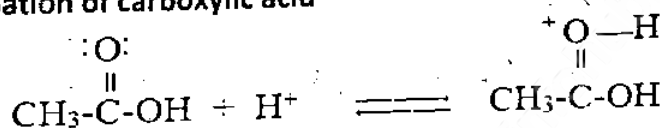
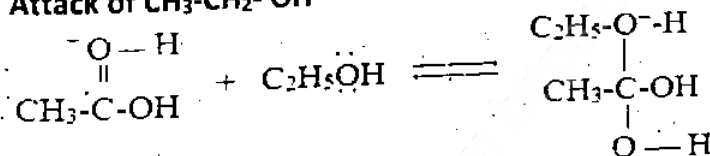
13 **Write down mechanism of reactions. / Give two reactions of carboxylic acids in which OH group of the acids are involved.** **(6 times)**

(a) Between acetic acid and ethanol (b) Acetic acid and thinoyl chloride

Ans: **(a).. Between acetic acid and ethanol / Mechanism of esterification.**

$$CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$$

(i).. Protonation of carboxylic acid

$$CH_3-\overset{\overset{:O:}{||}}{C}-OH + H^+ \rightleftharpoons CH_3-\overset{\overset{^+O-H}{||}}{C}-OH$$

(ii).. Attack of CH_3-CH_2- OH

$$CH_3-\overset{\overset{^-O-H}{||}}{C}-OH + C_2H_5\ddot{O}H \rightleftharpoons CH_3-\underset{\underset{O-H}{|}}{\overset{\overset{C_2H_5-O^--H}{|}}{C}}-OH$$

(iii).. Hydrogen Ion Transfer

$$CH_3-\underset{\underset{O-H}{|}}{\overset{\overset{C_2H_5-O^--H}{|}}{C}}-OH \rightleftharpoons CH_3-\underset{\underset{O-H}{|}}{\overset{\overset{C_2H_5-O}{|}}{C}}-\overset{+}{O}H_2$$

(iv).. Elimination of Water and H^+

$$CH_3-\underset{\underset{O-H}{|}}{\overset{\overset{C_2H_5-O}{|}}{C}}-\overset{+}{O}H_2 \underset{-H^+}{\overset{-H_2O}{\rightleftharpoons}} CH_3-\overset{\overset{C_2H_5-O}{|}}{C}=O$$

(b).. Acetic acid and thinoyl chloride

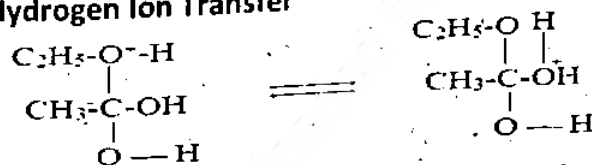
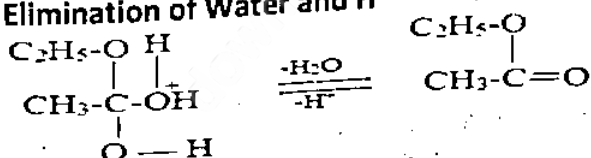
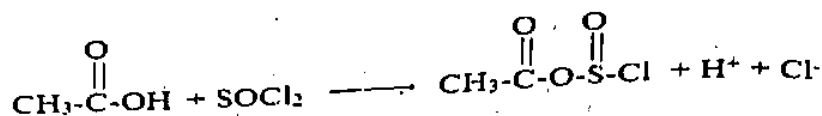
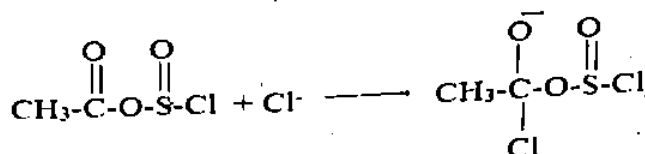
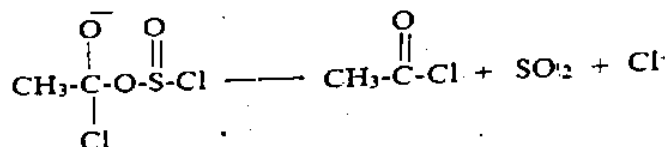
(i)..

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}OH + SOCl_2 \longrightarrow CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl + H^+ + Cl^-$$

(ii)..

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl + Cl^- \longrightarrow CH_3\text{-}\underset{Cl}{\underset{|}{\overset{\bar{O}}{\overset{|}{C}}}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl$$

(iii)..

$$CH_3\text{-}\underset{Cl}{\underset{|}{\overset{\bar{O}}{\overset{|}{C}}}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl \longrightarrow CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}Cl + SO_2 + Cl^-$$

Acetyl chloride

14 **Prove by equations that CH_3COOH is used to prepare.** **(3 times)**
(a)acetyl chloride **(b)acetic anhydride**

Ans: **(a)acetyl chloride**

(i)..

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}OH + SOCl_2 \longrightarrow CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl + H^+ + Cl^-$$

(ii)..

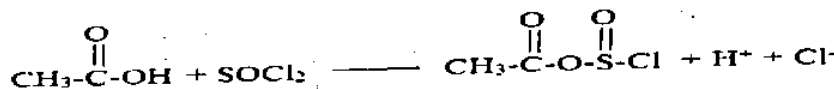
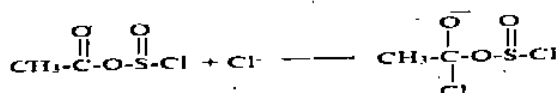
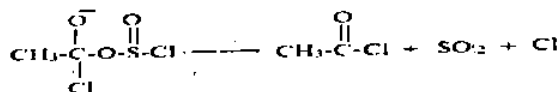
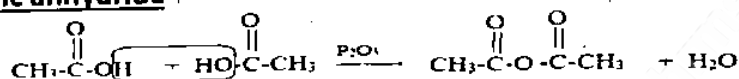
$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl + Cl^- \longrightarrow CH_3\text{-}\underset{Cl}{\underset{|}{\overset{\bar{O}}{\overset{|}{C}}}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl$$

(iii)..

$$CH_3\text{-}\underset{Cl}{\underset{|}{\overset{\bar{O}}{\overset{|}{C}}}}\text{-}O\text{-}\overset{O}{\overset{||}{S}}\text{-}Cl \longrightarrow CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}Cl + SO_2 + Cl^-$$

Acetyl chloride

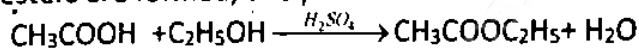
(b)acetic anhydride

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\boxed{H + HO}\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 \xrightarrow{P_2O_5} CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 + H_2O$$

Acetic anhydride

Topic No: 13.6/b

15 **Manipulate the term 'Esterification' using ethyl alcohol as an example?**

Ans: **Esterification:-**When carboxylic acids are heated in the presence of concentrated H_2SO_4 esters are formed, this process is called esterification process.

$$CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$$

16 **Write down the names of two esters having the following flavours:** **(2 Times)**

(i) Pineapple **(ii)Jasmine**

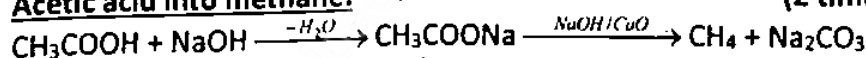
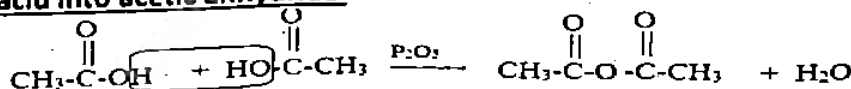
Ans: (i).. Pineapple flavour is produced by Ethyl butyrate.
(ii).. Jasmineflavour is produced by Benzylacetate.

17 **How would you convert acetic acid into methane and acetic anhydride?** **(2 times)**

Ans: **Acetic acid into methane:**

$$CH_3COOH + NaOH \xrightarrow{-H_2O} CH_3COONa \xrightarrow{NaOH/CaO} CH_4 + Na_2CO_3$$

Acetic acid into acetic anhydride:

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\boxed{H + HO}\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 \xrightarrow{P_2O_5} CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 + H_2O$$

18. **Write the mechanism of Amide formation.**

Ans: **Mechanism of Amide formation:**

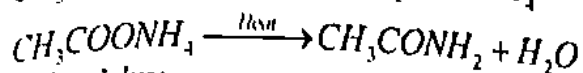
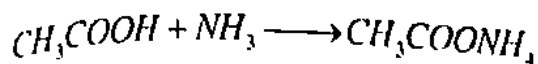
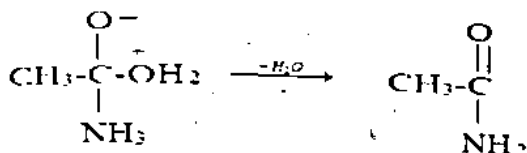
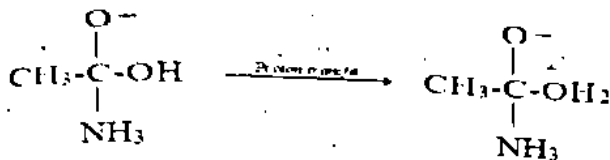
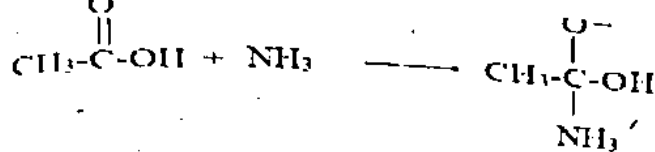
$$CH_3COOH + NH_3 \longrightarrow CH_3COONH_4$$

$$CH_3COONH_4 \xrightarrow{Heat} CH_3CONH_2 + H_2O$$

Mechanisim:

$$CH_3-\overset{O}{\overset{||}{C}}-OH + NH_3 \longrightarrow CH_3-\overset{O^-}{\overset{|}{\underset{NH_3}{\underset{|}{C}}}}-OH$$

$$CH_3-\overset{O^-}{\overset{|}{\underset{NH_3}{\underset{|}{C}}}}-OH \xrightarrow{\text{Proton transfer}} CH_3-\overset{O^-}{\overset{|}{\underset{NH_3}{\underset{|}{C}}}}-\overset{+}{O}H_2$$

$$CH_3-\overset{O^-}{\overset{|}{\underset{NH_3}{\underset{|}{C}}}}-\overset{+}{O}H_2 \xrightarrow{-H_2O} CH_3-\overset{O}{\overset{||}{\underset{NH_2}{\underset{|}{C}}}}$$

Acetamide

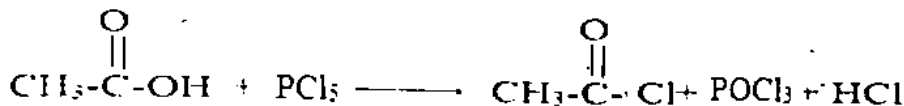
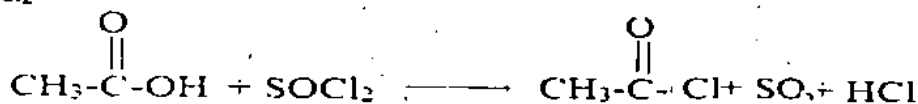
19 How acetic acid reacts with (a) PCl_5 (b) $SOCl_2$ (2 times)

Ans:

(a) PCl_5

$$CH_3-\overset{O}{\overset{||}{C}}-OH + PCl_5 \longrightarrow CH_3-\overset{O}{\overset{||}{C}}-Cl + POCl_3 + HCl$$

(b) $SOCl_2$

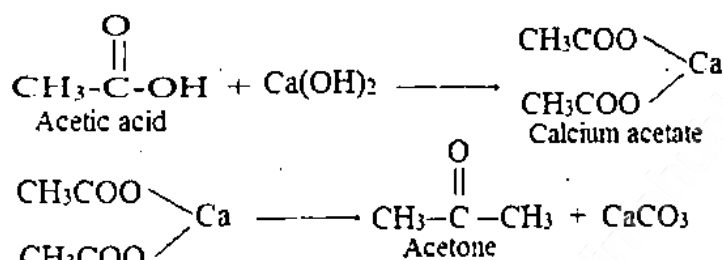
$$CH_3-\overset{O}{\overset{||}{C}}-OH + SOCl_2 \longrightarrow CH_3-\overset{O}{\overset{||}{C}}-Cl + SO_2 + HCl$$

20. Which Ester gives banana and orange smell? (2 Times)

Ans: Amylacetate gives banana whiie octylacetate gives orange smell.

21 Convert acetic acid into Ketone.

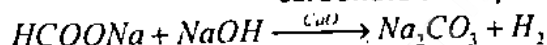
Ans:

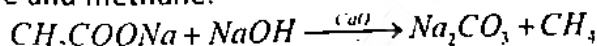
$$\underset{\text{Acetic acid}}{CH_3-\overset{O}{\overset{||}{C}}-OH} + Ca(OH)_2 \longrightarrow \underset{\text{Calcium acetate}}{(CH_3COO)_2Ca}$$

$$(CH_3COO)_2Ca \longrightarrow \underset{\text{Acetone}}{CH_3-\overset{O}{\overset{||}{C}}-CH_3} + CaCO_3$$

22 What happens when followings are heated? (2 times)

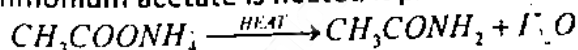
(a) Sodium Format and soda lime (b) Sodium Acetate and Soda Lime

Ans: (a): When sodium formateis heated with soda lime, it decomposes to give sodium carbonate and hydrogen.

$$HCOONa + NaOH \xrightarrow{CaO} Na_2CO_3 + H_2$$

(b)When sodium acetate is heated with soda lime, it decomposes to give sodium carbonate and methane.

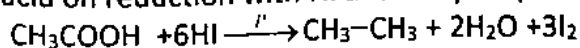
$$CH_3COONa + NaOH \xrightarrow{CaO} Na_2CO_3 + CH_4$$

23 What happens when ammonium acetate is heated? (3 Times)

Ans: When ammonium acetate is heated it produce acid amide:

$$CH_3COONH_4 \xrightarrow{HEAT} CH_3CONH_2 + H_2O$$

Topic No: 13.6/c

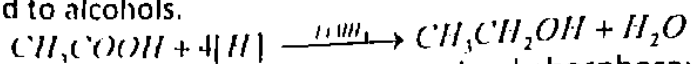
24 Prepare ethane from acetic acid by reduction with HI\P? / Convert acetic acid into ethane by reduction method. (2 Times)

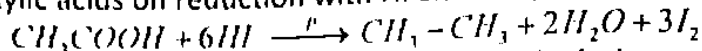
Ans: Acetic acid on reduction with HI and red phosphorus give ethane.

$$CH_3COOH + 6HI \xrightarrow{P} CH_3-CH_3 + 2H_2O + 3I_2$$

25. Prepare alcohol and alkane from carboxylic acid. / Convert acetic acid into (a) Ethane (b) Ethyl alcohol. **(5 times)**

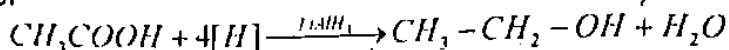
Ans: **Preparation of alcohol and alkane from carboxylic acid:**

Carboxylic acids on reduction with lithium aluminium hydride ($LiAlH_4$) are reduced to alcohols.

$$CH_3COOH + 4[H] \xrightarrow{LiAlH_4} CH_3CH_2OH + H_2O$$

Carboxylic acids on reduction with HI and red phosphorous give alkanes.

$$CH_3COOH + 6HI \xrightarrow{P} CH_3 - CH_3 + 2H_2O + 3I_2$$

26 How acetic acid can be converted into ethyl alcohol.

Ans: Carboxylic acid on reaction with lithium aluminium hydride ($LiAlH_4$) are reduced to alcohol

$$CH_3COOH + 4[H] \xrightarrow{LiAlH_4} CH_3 - CH_2 - OH + H_2O$$

27 Write down the I.U.P.A.C. names of: (a)$CH_2(COOH)_2$ (b)$NH_2 - CH_2 - COOH$

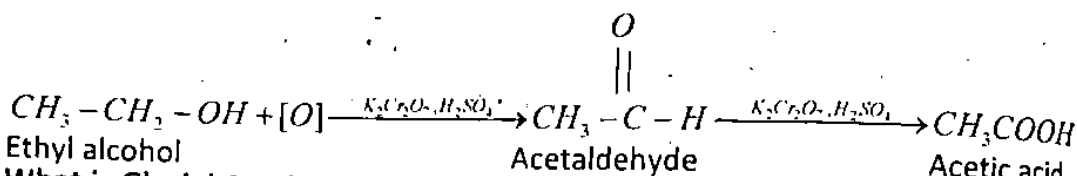
Ans: (a)$CH_2(COOH)_2$: Propanedioic acid

(b)$NH_2 - CH_2 - COOH$: 2-amino ethanoic acid

Topic No: 13.7

28 What is vinegar? How is it prepared from ethanol?

Ans: Acetic acid is the most important carboxylic acid. Its dilute solution is known as vinegar.

$$\underset{\text{Ethyl alcohol}}{CH_3 - CH_2 - OH} + [O] \xrightarrow{K_2Cr_2O_7, H_2SO_4} \underset{\text{Acetaldehyde}}{CH_3 - \overset{\overset{O}{||}}{C} - H} \xrightarrow{K_2Cr_2O_7, H_2SO_4} \underset{\text{Acetic acid}}{CH_3COOH}$$

29. What is Glacial Acetic Acid? **(3 times)**

Ans: The pure acetic acid freezes to an ice like solid at 17°C, therefore it is called glacial acetic acid. It is miscible with water, alcohol and ether in all proportions.

30 Give four uses of acetic acid? **(6 times)**

Ans: Acetic acid is used:

(i).. as a coagulant for latex in rubber industry.

(ii).. in the manufacture of plastics (polyvinyl acetate) rayon (cellulose acetate) and silk.

(iii).. in medicine as a local irritant.

(iv).. as a solvent in the laboratory for carrying out reactions.

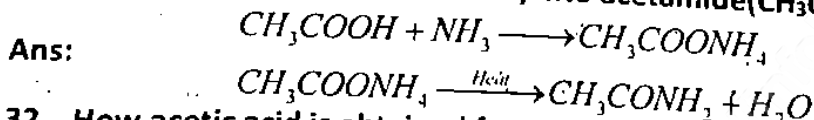
(v).. in the manufacturing of pickles.

(vi).. in the manufacturing of many organic compounds like acetone, acetates and esters.

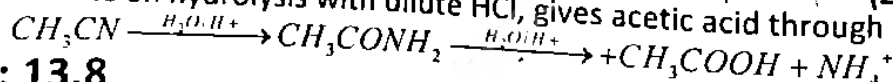
31 Convert acetic acid(CH_3COOH) into acetamide(CH_3CONH_2). **(5 times)**

Ans:

$$CH_3COOH + NH_3 \longrightarrow CH_3COONH_4$$

$$CH_3COONH_4 \xrightarrow{Heat} CH_3CONH_2 + H_2O$$

32 How acetic acid is obtained from methyl cyanide? **(2 times)**

Ans: Ethane nitrile on hydrolysis with dilute HCl, gives acetic acid through acetamide.

$$CH_3CN \xrightarrow{H_2O, H^+} CH_3CONH_2 \xrightarrow{H_2O, H^+} +CH_3COOH + NH_4^+$$

Topic No: 13.8

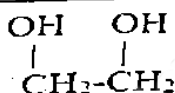
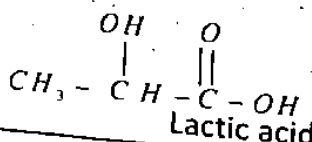
33 Differentiate between acidic and basic amino acids?

Ans: **Acidic and basic amino acids:-** The amino acids which contain two carboxyl group are called acidic amino acids, while those containing two amino groups are called basic amino acids. For example, glutamic acid and aspartic acid are acidic amino acids while lysine is a basic amino acid.

34 Write structural formulae of ethylene glycol and lactic acid?

Ans: **Structural formulae of ethylene glycol and lactic acid:-**

$$\underset{\text{Ethylene Glycol}}{\overset{\overset{OH}{|}}{CH_2} - \overset{\overset{OH}{|}}{CH_2}}$$

$$\underset{\text{Lactic acid}}{CH_3 - \overset{\overset{OH}{|}}{C}H - \overset{\overset{O}{||}}{C} - OH}$$

35 What are Acidic Amino acids? Give example. **(2 times)**

Ans: The amino acids which contain two carboxyl group are called acidic amino acids. For example, glutamic acid and aspartic acid are acidic amino acids.

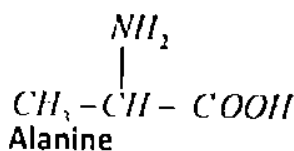
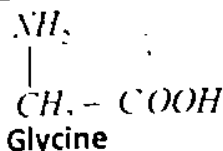
36. Define and give example of neutral amino acids. **(4 times)**

Ans: The amino acids which does not contain two carboxyl group or two amino group are called neutral amino acids. For example: Glycine, alanine, valine and proline.

Topic No: 13.8.1

37. Write the formulae of glycine and alanine. **(2 times)**

Ans: Formulae of glycine and alanine:

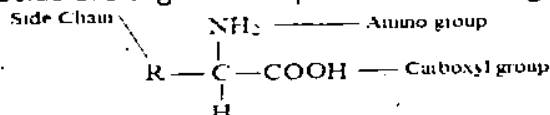
Glycine Alanine

38 Define and differentiate between essential and non essential amino acids **(7 times)**

Ans: The ten amino acids which body can synthesiseare called non-essential amino acids. The remaining ten amino acids which the body is not able to synthesize are called essential amino acids. The essential amino acids must be supplied to our bodies through our diet because they are required for proper health and growth. The deficiency of essential amino acids may cause diseases.

39 What are amino acids? Write their general formula. **(2 times)**

Ans: Amino acids are organic compounds containing both amino and carboxyl group.

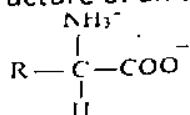
$$R-\underset{\substack{|\\H}}{\overset{\substack{NH_2\\|}}{C}}-COOH$$

Side Chain (R); NH_2 — Amino group; COOH — Carboxyl group

R is different for different amino acids. The amino group may be present at any carbon atom other than that of carboxyl group (-COOH).

Topic No: 13.8.3

40 What is Zwitter Ion? **(5 times)**

Ans: Zwitter Ion:- The amino acid exist as dipolar ion called Zwitter ion. It has positive as well as negative ends within the same molecule. In the formation of Zwitter ion, the proton goes from the carboxyl group to amino group. The Zwitter ionic structure of an amino acid may be written as:

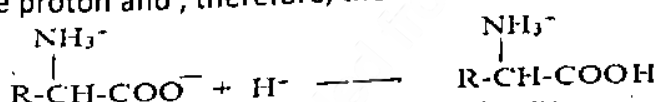
$$R-\underset{\substack{|\\H}}{\overset{\substack{NH_3^+\\|}}{C}}-COO^-$$

Zwitter ionic structure

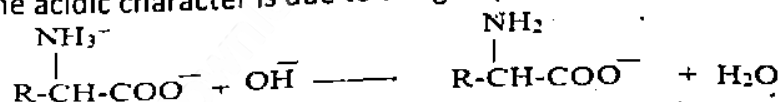
Topic No: 13.8.4

41 Explain acidic and basic character of amino acid? **(5 times)**

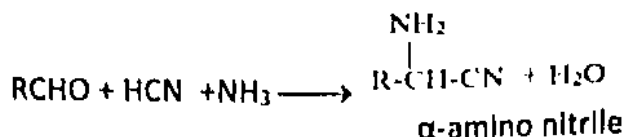
Ans: On the basis of dipolar ion structure, the acidic and basic reactions of amino acids may be represented as:

1.. When an acid is added to an amino acid the carboxylic acid the carboxylate ion accepts the proton and , therefore, the basic character is due to this group.

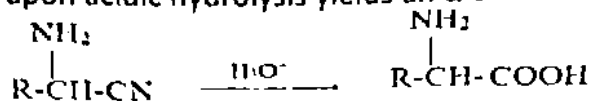
$$R-\overset{\substack{NH_3^+\\|}}{C}H-COO^- + H^+ \longrightarrow R-\overset{\substack{NH_3^+\\|}}{C}H-COOH$$

2.. When an alkali is added to an amino acid, $-NH_2$ group releases the proton and therefore the acidic character is due to the group.

$$R-\overset{\substack{NH_3^+\\|}}{C}H-COO^- + OH^- \longrightarrow R-\overset{\substack{NH_2\\|}}{C}H-COO^- + H_2O$$

42. Discuss Strecker's synthesis fir the preparation of amino acids? **(4 times)**

Ans: Strecker's synthesis:-When hydrogen cyanide is added to an aldehyde in the presence of ammonia, α-amino acid is obtained.

$$RCHO + HCN + NH_3 \longrightarrow R\text{-}\underset{}{\overset{NH_2}{\overset{|}{C}}}H\text{-}CN + H_2O$$

α-amino nitrile

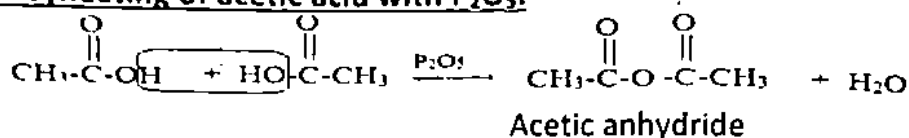
α-amino nitrile upon acidic hydrolysis yields an α-amino acid.

$$R\text{-}\overset{NH_2}{\overset{|}{C}}H\text{-}CN \xrightarrow{H_3O^+} R\text{-}\overset{NH_2}{\overset{|}{C}}H\text{-}COOH$$

Topic No: 13.8.5

43. What product is obtained when acetic acid is heated with P_2O_5?

Ans: <u>Product byheating of acetic acid with P_2O_5:</u>

$$CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}OH + HO\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 \xrightarrow{P_2O_5} CH_3\text{-}\overset{O}{\overset{||}{C}}\text{-}O\text{-}\overset{O}{\overset{||}{C}}\text{-}CH_3 + H_2O$$

Acetic anhydride

Topic No: 13.8.7

44 What is Ninhydrin Test?

Ans: Ninhydrin reacts with amino acid to form an intensely coloured bluish violet product. The ninhydrinreactin is also widely used to visualize amino acids separately by paper chromatography.

Topic No: 13.8.8

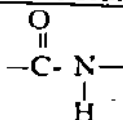
45 What is the difference between peptide and proteins? (2 times)

Ans: <u>Peptides</u> are the compounds formed by the condensation of two or more same or different α-amino acids. The condensation occurs between amino acids with the elimination of water.

The formation of peptide bonds can continue until a molecule containing several hundred thousand amino acids is formed. Such a molecule is called polypeptide or protein. By convention a peptide having molecular mass upto 10,000 molecules is called a polypeptide while a peptide having a molecular mass more than 10,000 is called a protein.

46 Write general structure of peptide linkage?

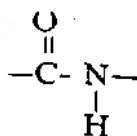
Ans: <u>General structure of peptide linkage:-</u>

$$-\overset{O}{\overset{||}{C}}\text{-}\underset{H}{\underset{|}{N}}-$$

47 What is meant by polypeptide and protein?

Ans: <u>Polypeptide and protein:-</u>The formation of peptide bonds can continue until a molecule containing several hundred thousand amino acids is formed. Such a molecule is called **polypeptide** or protein. By convention a peptide having molecular mass upto 10,000 molecules is called a polypeptide while a peptide having a molecular mass more than 10,000 is called a **protein**.

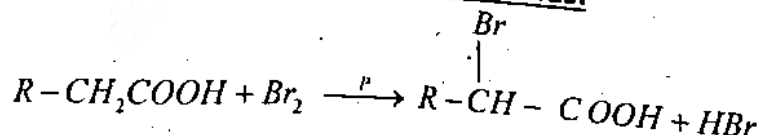
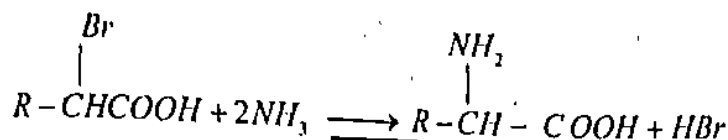
48. What is peptide bond? Write down the formula of a dipeptide.

Ans: <u>Peptide bond:</u>The formation of peptide bonds can continue until a molecule containing several hundred thousand amino acids is formed. Such a molecule is called**polypeptide** or protein.

$$-\overset{O}{\overset{||}{C}}\text{-}\underset{H}{\underset{|}{N}}-$$

49. How carboxylic acids are converted into α-amino acids?

Ans: <u>Conversion of carboxylic acids into α-amino acids:</u>

$$R-CH_2COOH + Br_2 \xrightarrow{P} R-\overset{Br}{\overset{|}{C}}H-COOH + HBr$$

$$R-\underset{|}{\overset{Br}{C}}HCOOH + 2NH_3 \longrightarrow R-\overset{NH_2}{\overset{|}{C}}H-COOH + HBr$$

2018

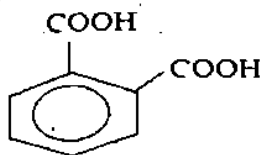
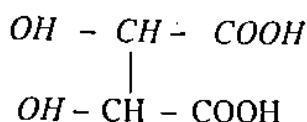
50. Write structural formulae of these compounds. (a) Phthalic acid (b) tartaric acid

Ans: **Structural formulae:**

Phthalic acid

COOH
COOH

Tartaric acid

$$OH-CH-COOH$$
$$|$$
$$OH-CH-COOH$$

2019

51. Write down structural formula of: (a) proponoic acid (b) Oxalic acid (c) Benzoic acid (d) Acetic anhydride.

Ans: **Propanoic acid:**

$$CH_3CH_2COOH$$

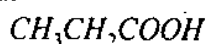
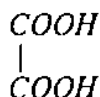
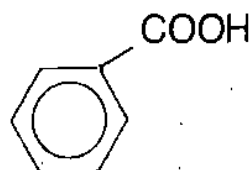
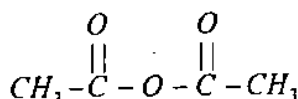
Oxalic acid:

$$\begin{array}{c}COOH\\|\\COOH\end{array}$$

Benzoic acid:

COOH

Acetic anhydride

$$CH_3-\overset{O}{\overset{||}{C}}-O-\overset{O}{\overset{||}{C}}-CH_3$$

52. Write down formulas of

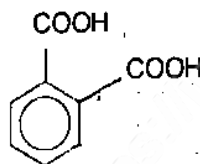
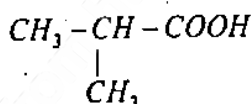
(i) Phthalic acid (ii) Iso-Butyric acid

Ans:

Phthalic acid

COOH
COOH

Iso-Butyric acid

$$CH_3-\underset{CH_3}{\underset{|}{CH}}-COOH$$

53. What happens when carboxylic acids react with metals?

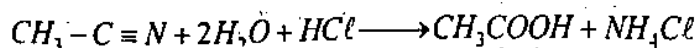
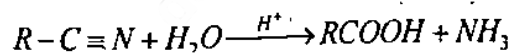
Ans: Carboxylic acids react with active metals like Na, K, Ca, Mg etc to form their salts alongwith evolution of H_2.

$$2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2$$

54. How are carboxylic acids prepared from alkyl nitrites.

Ans:

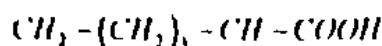
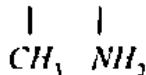
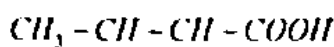
$$R-C\equiv N + H_2O \xrightarrow{H^+} RCOOH + NH_3$$

$$CH_3-C\equiv N + 2H_2O + HC\ell \longrightarrow CH_3COOH + NH_4C\ell$$

55. Write structural formula of (I) Lysine (II) Valine

Ans: (I) Lysine

$$\begin{array}{l} CH_2-(CH_2)_3-CH-COOH \\ \ \ | \qquad\qquad\qquad | \\ NH_2 \qquad\qquad NH_2 \end{array}$$

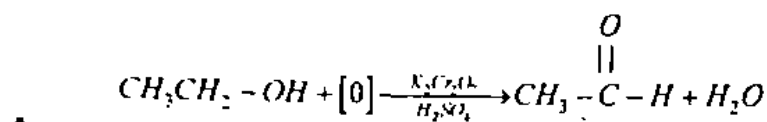
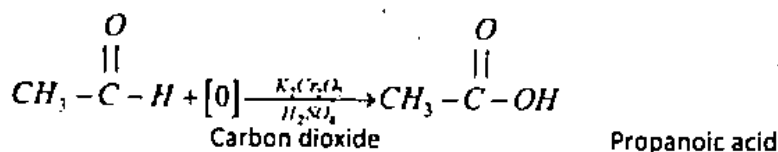
(ii) Valine

$$\begin{array}{l} CH_3-CH-CH-COOH \\ \qquad\quad | \qquad | \\ \qquad CH_3 \quad NH_2 \end{array}$$

56. How ethanol is converted to ethanoic acid.

Ans:

$$CH_3CH_2-OH+[O]\xrightarrow[H_2SO_4]{K_2Cr_2O_7}CH_3-\overset{\overset{O}{||}}{C}-H+H_2O$$

$$CH_3-\overset{\overset{O}{||}}{C}-H+[O]\xrightarrow[H_2SO_4]{K_2Cr_2O_7}CH_3-\overset{\overset{O}{||}}{C}-OH$$

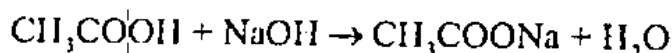
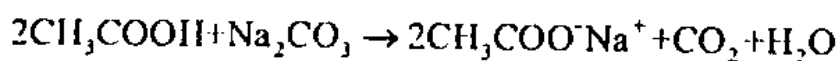
Carbon dioxide Propanoic acid

2021

57. Write the reactions of Acetic Acid with NaOH and Na_2CO_3.

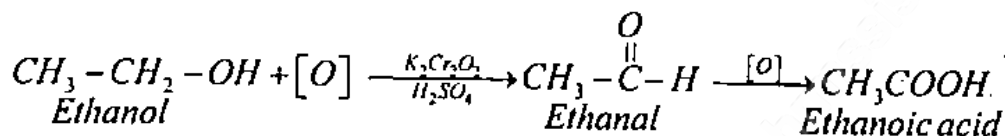
Ans: Reactions of Acetic Acid with NaOH :

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

Reactions of Acetic Acid with Na_2CO_3:

$$2CH_3COOH+Na_2CO_3 \rightarrow 2CH_3COO^-Na^+ +CO_2+H_2O$$

58. How would you prepare acetic acid from ethanol and a suitable alkane nitrile?

Ans: Preparation of acetic acid from ethanol:

$$\underset{Ethanol}{CH_3-CH_2-OH}+[O]\xrightarrow[H_2SO_4]{K_2Cr_2O_7}\underset{Ethanal}{CH_3-\overset{\overset{O}{||}}{C}-H}\xrightarrow{[O]}\underset{Ethanoic\ acid}{CH_3COOH}$$

Preparation of acetic acid from alkane nitrile:

$$CH_3\ C\equiv N + 2H_2O + HCl \longrightarrow CH_3COOH + NH_4Cl$$

59. How acetic acid is prepared from acetylene?

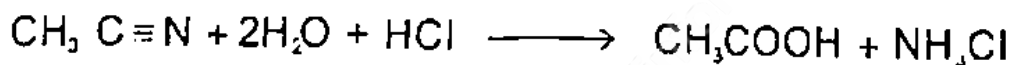
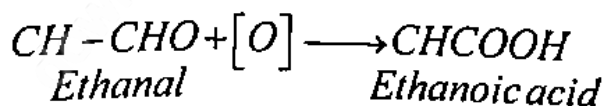
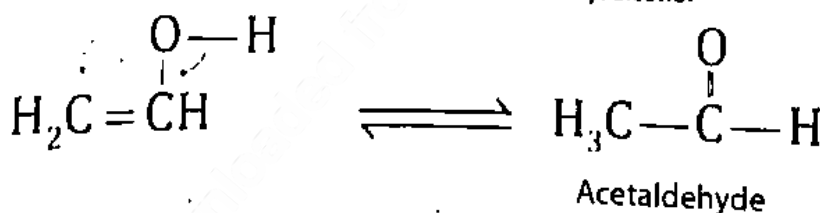
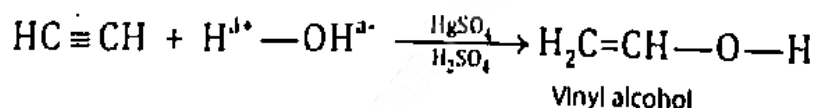
Ans:

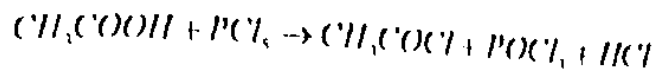
$$HC\equiv CH + H^{\delta+}-OH^{\delta-}\xrightarrow[H_2SO_4]{HgSO_4}H_2C=CH-O-H$$

Vinyl alcohol

$$H_2C=\overset{\overset{O-H}{|}}{CH} \rightleftharpoons H_3C-\overset{\overset{O}{||}}{C}-H$$

Acetaldehyde

$$\underset{Ethanal}{CH-CHO}+[O]\longrightarrow\underset{Ethanoic\ acid}{CHCOOH}$$

60. Give reactions of acetic acid with (a) PCl_5 (b) NaOH

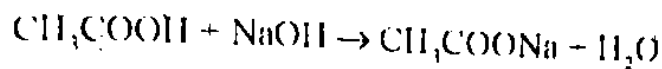
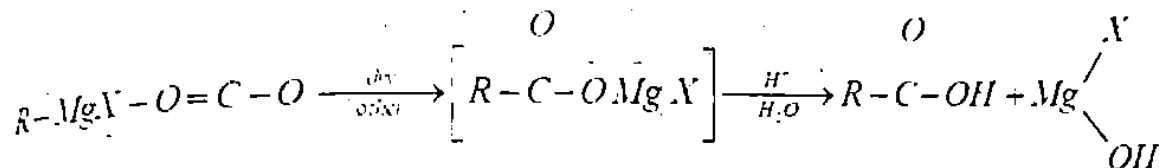
Ans: (a) **Reactions of acetic acid with PCl_5:**

$$CH_3COOH + PCl_5 \rightarrow CH_3COCl + POCl_3 + HCl$$

(b) **Reactions of acetic acid with NaOH:**

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

61. **Give reaction to prepare carboxylic acid from Grignard's reagent.**

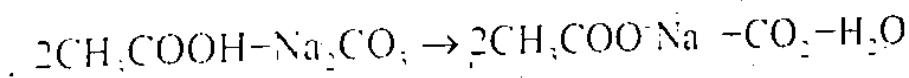
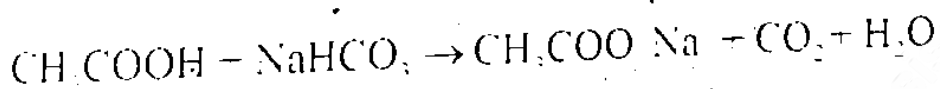
Ans:

$$R-MgX + O=C=O \xrightarrow[\text{ether}]{\text{dry}} \left[R-\overset{O}{\overset{\|}{C}}-OMgX \right] \xrightarrow[H_2O]{H^+} R-\overset{O}{\overset{\|}{C}}-OH + Mg\begin{matrix} X \\ OH \end{matrix}$$

62. **Give reactions of Acetic Acid with : (a) Na_2CO_3 (b) $NaHCO_3$**

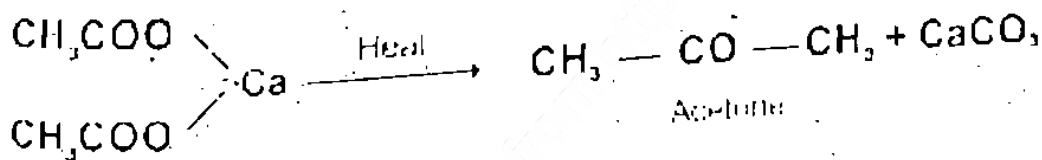
Ans: (a) Na_2CO_3 :

$$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COO^-Na^+ + CO_2 + H_2O$$

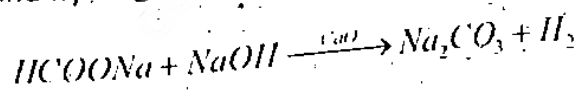
(b) $NaHCO_3$:

$$CH_3COOH + NaHCO_3 \rightarrow CH_3COO^-Na^+ + CO_2 + H_2O$$

63. **What happens when we heat? (1) Calcium acetate (2) Sodium formate with Soda lime**

Ans: **(1) Calcium acetate . (ii) Sodium formate with Soda lime**

$$\begin{matrix} CH_3COO \\ CH_3COO \end{matrix}\Big\rangle Ca \xrightarrow{\text{Heat}} \underset{\text{Acetone}}{CH_3-CO-CH_3} + CaCO_3$$

(2) Sodium formate with Soda lime

When sodium formateis heated with soda lime, it decomposes to give sodium carbonate and hydrogen.

$$HCOONa + NaOH \xrightarrow{CaO} Na_2CO_3 + H_2$$

CH. NO:13 CARBOXYLIC ACIDS LONG QUESTIONS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 13.3

1. Write your methods for the preparation of carboxylic acids.
Ans: (Text Book Page No:251)
2. Prepare acetic acid from a) Methyl nitrile b) Acetylene
Ans: (Text Book Page No:258)
3. Write down any four methods for preparation of carboxylic acids.
Ans: (Text Book Page No:251)
4. Write down any three methods to prepare acetic acid. What is glacial acetic acid.
Ans: (Text Book Page No:258)
5. How would you prepare carboxylic acid for primary alcohols and aldehydes?
Ans: (Text Book Page No:251)

Topic No: 13.6

6. Write the reactions of acetic acid with:
i) Na_2CO_3 ii) $NaHCO_3$ iii) NaOH iv) Na
Ans: (Text Book Page No:254)
7. Writedown the reactions of acetic acid with:
i) Na_2CO_3 ii) PCl_5 iii) C_2H_5OH iv) NH_3
Ans: (Text Book Page No:254)
8. Write down the mechanism of conversion of acetic acid to:
i) Acetyl Chloride ii) Acetamid
Ans: (Text Book Page No:255+256)
9. Write down mechanism of reaction between acetic acid and thionyl chloride.
Ans: (Text Book Page No:255)

Topic No: 13.6/b

10. Discuss mechanism of esterification between a carboxylic acid and alcohol.
Ans: (Text Book Page No:255)
11. How would you convert acetic acid into the following compounds:
i) Methane ii) Ethanol iii) Ethane iv) Acetic anhydride
Ans: (Text Book Page No:256)
12Convert acetic acid into: i) Methane ii) Acetyl chloride
Ans: (Text Book Page No:255)

Topic No: 13.7.5

13. Give any four use of acetic acid.
Ans: (Text Book Page No:258)

Topic No: 13.8

14. Convert acetic acid into: i) Methane ii) Acetyl chloride
Ans: (Text Book Page No:255)
15. What are essential and non-essential amino acid? Briefly describe the strecker for α – amino acid.
Ans: (Text Book Page No:259+261)

Topic No: 13.8.3

16. DefineZwiitter ion. Discuss effect of acidic and basic medium on the dipoler ion structure of atomic acid.
Ans: (Text Book Page No:260)

Topic No: 13.8.4

17. Write a short note on acidic and basic character of amino acids.
Ans: (Text Book Page No:261)

Topic No: 13.8.5

18. Give two methods of preparation and two reactions of amino acid.
Ans: (Text Book Page No:261+262)
19. Write any two methods for synthesis of amino acids.
Ans: (Text Book Page No:261)
20. Give two methods for the preparation of amino acid.
Ans: (Text Book Page No:261)

CHAPTER NO:14 MACROMOLECULES
OBJECTIVES (MCQ'S)
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 14.4

1. Which of the following is an addition polymer: **(6 times)**
(a) Polyester (b) Polystyrene (c) Nylon 6,6 (d) Terylene

2. Polymerization of acrylonitrile give:
(a) PVC (b) Rayon fiber (c) Acrylic fiber (d) Polyester fiber

3.Thefibre which is made from acrylonitrile as monomer is: **(5 times)**
(a) Acrylic fibre (b) Polyester fibre (c) PVC (d) Rayon fibre

4-Which of the following is an addition polymer: **(5 times)**
(a) Nylon 6 , 6 (b) Epoxy Resin (c)Terylene (d) Polystyrene

5- Which one of following is a condensation polymer?
(a) Polystyrene (b) PVC (c)Polyethene (d) Nylon 6 , 6

Topic No: 14.5

6. Which polymer is synthetic polymer? **(4 times)**
(a) Animal fat (b) Starch (c) Cellulose (d) Polyester

Topic No: 14.6.1

7- Which one of the following statements about Glucose and Sucrose is correct?
(A) Both are Insoluble in Water (B) Both are naturally occurring
(C) Both are Hexoses (D) Both are Disaccharide

8. Starch is a polymer of:
(a) α -D-glucose (b) β -D-glucose (c) α -D-fructose (d) β -D-fructose

9. Starch is:
(a) Monosaccharide (b) Disaccharide (c) Polysaccharide (d) Oligosaccharide

10- Which of the following is mono-saccharide:
(a) Fructose (b) Sucrose (c) Starch (d) Callulose

Topic No: 14.6.3

11- Which one of the following element is present in all Proteins:
(A) Cl (B) Cu (C) N (D) Al

Topic No: 14.6.10

12- Vegetable oils are:
(a) unsaturated fatty acids (b)glycrides of unsaturated fatty acids
(c) glycerides of saturated fatty acids (d) essential oils obtained from plants

Topic No: 14.6.13

13. The reaction between fat and NaOH is called: **(6 times)**
(a) Esterification (b) Hydrogenolysis (c) Fermentation (d) Saponification

14. The hydrolysis of fat is brought about by: **(5 times)**
(a) Lipase (b) Zymase (c) Maltase (d) Urease

15- Preparation of vegetable ghee involves: **(2 times)**
(a) halogenation (b) hydrogenation (c) hydroxylation (d) dehydrogenation

Topic No: 14.6.24

16- The enzyme used locally to stop the blood from the wound is: **(2 times)**
(a) Insulin (b) L-asparginase (c) Thrombin (d) Zymase

Topic No: 14.6.26

17. Which of the following nitrogenous base is not present in RNA? **(3 times)**
(a) Cytosine (b) Adenine (c) Thymine (d) Uracil

18- A polymeric substance that is formed in the liquid state and then hardened to a rigid solid is called:
(A) fiber (B) varnish (C) plastic (D) polyamide resin

19- Which is a water soluble vitamin? **(2 times)**
(a) Niacin (b) Riboflavin (c) Trypsin (d) Ascorbic acid

2018

20. _____ element is present in all proteins:
(a) Sulphur (b) Hydrogen (c) Carbon (d) Nitrogen

2019

21. Which one of the following statements about glucose and sucrose is incorrect?
(a) Both are soluble in water (b) Both are naturally occurring
(c) Both are Carbohydrates (d) Both are disaccharides

22. In which of these processes are small organic molecules made into macromolecules?
(a) The cracking of petroleum fractions (b) The fractional distillation of crude oil
(c) The polymerization of ethene (d) The hydrolysis of proteins

23. Which one of the following enzymes brings about the hydrolysis of fats:
(a) Urease (b) lipase (c) maltase (d) zymase

24. A polymer is a large molecule built up by the repetition of small and simple chemical units, known as:
(a) Monomers (b) Dimers (c) Tetramers (d) Trimers

25. The polymer which can be softened and hardened by heating and cooling is called:
(a) Thermoplastic (b) Thermosetting (c) Proteins (d) Fats

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11	12	13
B	C	A	D	D	D	B	A	C	A	C	B	D
14	15	16	17	18	19	20	21	22	23	24	25	
A	B	C	C	C	D	D	D	C	B	A	A	

CHAPTER NO:14 MACROMOLECULES
SHORT QUESTIONS
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 14.1

1. **What are macromolecules? Give two examples.**

Ans: Macromolecules or polymers are described as large molecules built up from small repeating units called monomers.
For example: Wool, cotton, PVA, PVC etc.

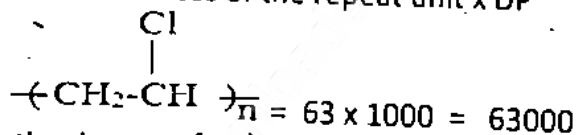
2. **What are polymers? Give two examples.** **(2 times)**

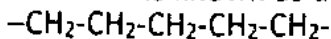
Ans: Polymers are described as large molecules built up from small repeating units called monomers. The word polymer is derived from Greek , 'poly' mean 'many' and 'mer' means 'parts'.
Examples: Cotton, wood, plastics, PVC, PVA etc.,

Topic No: 14.2

3. **How the degree of polymerization helps to determine the molar mass of the polymer?**

Ans: The molecular mass of the polymer is the product of the molecular mass of the repeating unit and the degree of polymerization. For example, polyvinyl chloride, a polymer of degree of polymerization 1000, has a molecular mass:
Mol. Mass = mol. Mass of the repeat unit x DP

$$\left(CH_2-\underset{|}{\overset{Cl}{CH}} \right)_n = 63 \times 1000 = 63000$$

4. **What is the degree of polymerization?**

Ans: The length of polymer chain is specialized by the number of repeating units in the chain is known as degree of polymerization . For example in linear polythene.
$-CH_2-CH_2-CH_2-CH_2-CH_2-$

The repeating unit is $-(CH_2-CH_2)_n-$ Where n is a large number.

The molecular mass of the polymer is the product of the molecular mass of the repeating unit and the degree of polymerization. For example, polyvinyl chloride, a polymer of degree of polymerization 1000, has a molecular mass:

Mol. Mass = mol. Mass of the repeat unit x DP

$$-(CH_2-\underset{Cl}{CH})_n- = 63 \times 1000 = 63000$$

Topic No: 14.3

5. Classify polymers on the basis of monomers? (4 times)

Ans: (i) **Homopolymer:** A homopolymeris formed by the polymerization of a single type of monomer.

(ii) **Copolymer:** A copolymer is formed by the polymerization of two monomer together, e.g; vinyl acetate reacts with butyl maleate to give a copolymer.

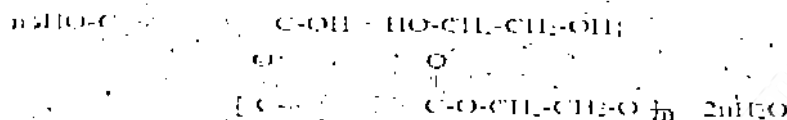
(iii) **Terpolymer:** In terpolymer, three different monomers are polymerized and the polymerization reaction is carefully controlled. For example; combination of butyl acrylate, methacrylate and acrylic acid monomers give a highly tough polymer which serves as a weather –resistant paint.

6. Give the classification of Polymers?

Ans: In 1929, W.H. Carothers suggested a classification of the polymerization process into two depending upon the way the polymers are formed.

(i). **Addition polymerization:** It is free radical addition reaction which involves initiation, propagation and termination steps. For example, polymerization of styrene. Addition of polymerization is catalyzed by thermal or photochemical decomposition of organic peroxides to give free radials.

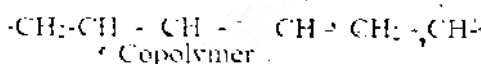
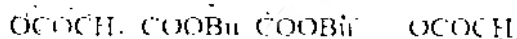
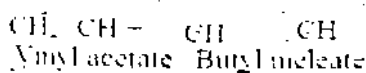
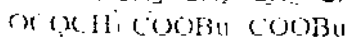
(ii). **Condensation polymerization:** The polymerization results from the mutual reaction of two functional groups. The reaction usually involves the removal of a water molecule or a methanol molecule. It takes place at both ends of the growing chain. For example; dicarboxylic acids or esters combine with diols to get desired polymer like nylon and polyester fibre. Such polymerizations are generally ionic in nature.

$$n\,HO-\overset{O}{\overset{\|}{C}}-C_6H_4-\overset{O}{\overset{\|}{C}}-OH + HO-CH_2-CH_2-OH \rightarrow -[\overset{O}{\overset{\|}{C}}-C_6H_4-\overset{O}{\overset{\|}{C}}-O-CH_2-CH_2-O]_n- + 2nH_2O$$

Topic No: 14.3/2

7. What is copolymer? Also give the reaction. (2 times)

Ans: Copolymer is formed by the polymerization of two monomers together, eg; vinyl acetate reacts with butyl maleate to give a copolymer. For example:

(Bu means $CH_3-CH_2-CH_2-CH_2-$)

$$\underset{\text{Vinyl acetate}}{\overset{OCOCH_3}{CH_2=CH}} + \underset{\text{Butyl meleate}}{\overset{COOBu\ \ COOBu}{CH=CH}} \rightarrow \underset{\text{Copolymer}}{-CH_2-\overset{OCOCH_3}{CH}-\overset{COOBu}{CH}-\overset{COOBu}{CH}-CH_2-\overset{OCOCH_3}{CH}-}$$

Topic No: 14.3/3

8. What are thermoplastic & thermosetting polymers? (8 times)

Ans: **Thermoplastic polymers:** A thermoplastic polymer is one which can softened repeatedly when heated and hardened when cooled with a little change in properties. For example; PVC pipes, plastic toys, etc.

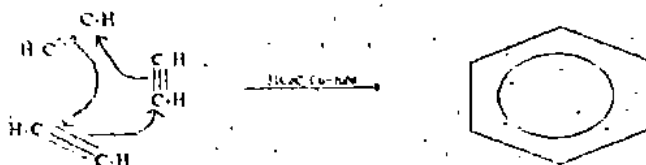
Thermosetting polymers: The polymers which become hard on heating and cannot be softened again are called thermosetting polymers. A thermosetting polymer, on heating, decomposes instead of melting. For example; synthetic varnish, epoxy resins, etc.

Topic No: 14.4

9. Define polymerization. Explain polymerization reaction of Acetylene.

Ans: Formation of polymers from its respective monomers at standard conditions is called polymerization.

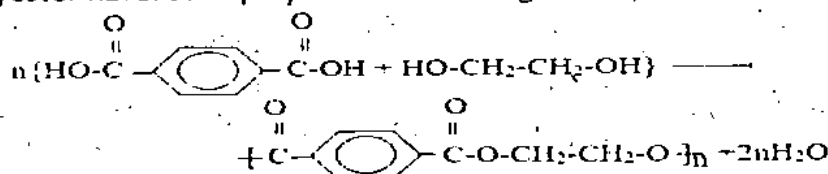
When acetylene is passed through a copper tube at 300°C, it polymerizes to benzene.

$$3\,HC\equiv CH \xrightarrow{300^\circ C,\ Cu\text{-tube}} C_6H_6$$

10. What is addition polymerization? Give example.

Ans: It is free radical addition reaction which involves initiation, propagation and termination steps. For example, polymerization of styrene. Addition of polymerization is catalyzed by thermal or photochemical decomposition of organic peroxides to give free radials.

11. Define condensation polymerization. Give the reaction for the formation of polyester? (6 times)

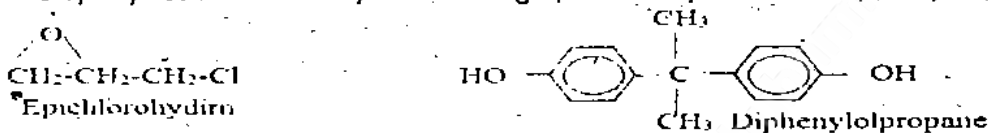
Ans: The polymerization results from the mutual reaction of two functional groups. The reaction usually involves the removal of a water molecule or a methanol molecule. It takes place at both ends of the growing chain. For example; dicarboxylic acids or esters combine with diols to get desired polymer like nylon and polyester fibre. Such polymerizations are generally ionic in nature.

$$n\{HO\text{-}\overset{O}{\overset{\|}{C}}\text{-}C_6H_4\text{-}\overset{O}{\overset{\|}{C}}\text{-}OH + HO\text{-}CH_2\text{-}CH_2\text{-}OH\} \longrightarrow +\!\overset{O}{\overset{\|}{C}}\text{-}C_6H_4\text{-}\overset{O}{\overset{\|}{C}}\text{-}O\text{-}CH_2\text{-}CH_2\text{-}O\!\}_n + 2nH_2O$$

Topic No: 14.5

12. What are epoxy resins? Give their uses (6 times)

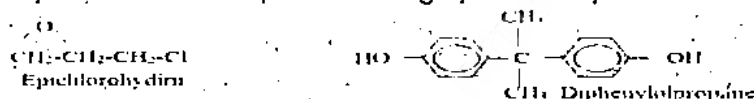
Ans: The epoxy resins are fundamentally polyethers but retain their name on the basis of the starting materials and the presence of epoxide group in the polymer. The epoxy resin is made by condensing epichlorohydrin with diphenylol propane.

$CH_2\text{-}CH_2\text{-}CH_2\text{-}Cl$ (with O bridge) — Epichlorohydrin

$HO\text{-}C_6H_4\text{-}C(CH_3)_2\text{-}C_6H_4\text{-}OH$ — Diphenylolpropane

13. Define epoxy resins? Give their importance. (2 times)

Ans: The epoxy resins are fundamentally polyethers but retain their name on the basis of the starting materials and the presence of epoxide group in the polymer. The epoxy resin is made by condensing epichlorohydrin with diphenylol propane.

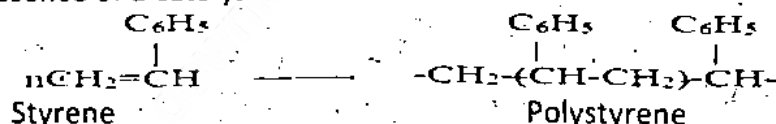
$CH_2\text{-}CH_2\text{-}CH_2\text{-}Cl$ (with O bridge) — Epichlorohydrin

$HO\text{-}C_6H_4\text{-}C(CH_3)_2\text{-}C_6H_4\text{-}OH$ — Diphenylolpropane

Importance of Epoxy resins: The major use of epoxy resins is in coating materials which give toughness flexibility, adhesion and chemical resistance. Industrial materials, thermal power stations, packing materials are coated with epoxy paints. Dams, bridges, floors, etc. are painted with epoxy resins.

14. How polystyrene is prepared? Give its uses. (2 times)

Ans: Polystyrene is an addition polymer obtained by the polymerization of styrene in the presence of a catalyst.

$$nCH_2=\underset{}{CH}(C_6H_5) \longrightarrow -CH_2\text{-}(\underset{C_6H_5}{CH}\text{-}CH_2)\text{-}\underset{C_6H_5}{CH}-$$

Styrene → Polystyrene

Uses: It is used in the manufacture of good containers, cosmetic bottles, toys and packing material, etc.

15. Write the uses of Polystrene.

Ans: Polystyrene is used in the manufacture of food contaners, cosmetic bottles, toys and packing material, etc.

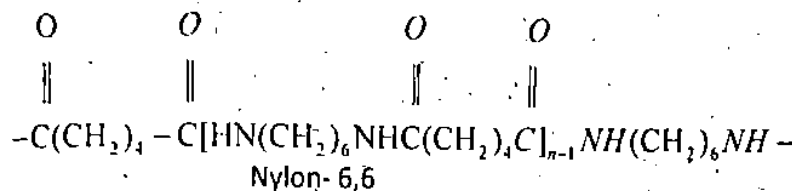
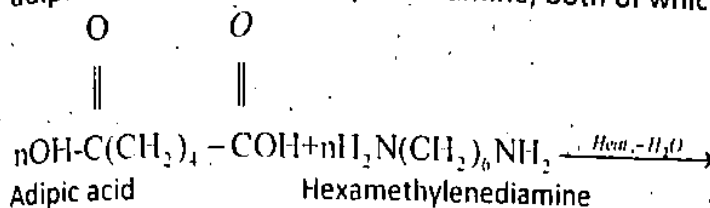
16. How Nylon 6,6 can be obtained? **(3 times)**

Ans: Nylon 6,6 is obtained by heating adipic acid (hexanedioic acid) with hexamethylenediammine. Nylon 6,6 derives its name form its starting material adipic acid and hexamethylenediamine, both of which have six carbon atoms.

$$nOH\text{-}\overset{\overset{O}{\|}}{C}(CH_2)_4-\overset{\overset{O}{\|}}{C}OH+nH_2N(CH_2)_6NH_2 \xrightarrow{Heat,-H_2O}$$

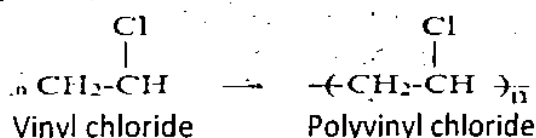
Adipic acid Hexamethylenediamine

$$-\overset{\overset{O}{\|}}{C}(CH_2)_4-\overset{\overset{O}{\|}}{C}[HN(CH_2)_6NH\overset{\overset{O}{\|}}{C}(CH_2)_4\overset{\overset{O}{\|}}{C}]_{n-1}NH(CH_2)_6NH-$$

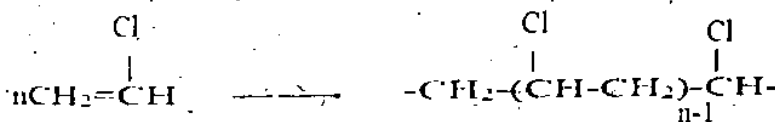
Nylon- 6,6

17. How PVC is prepared? Give its uses:

Ans: It is an addition polymer obtained by polymerizing vinyl chloride at 52°C and 9 atmospheric pressure.

$$n\,CH_2\text{-}\overset{\overset{Cl}{|}}{C}H \longrightarrow \left(CH_2\text{-}\overset{\overset{Cl}{|}}{C}H\right)_n$$

Vinyl chloride Polyvinyl chloride

18. What is PVC, give example?

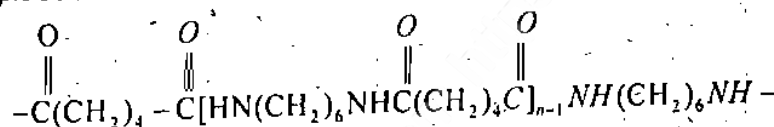
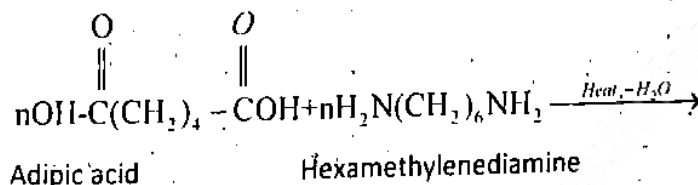
Ans: It is addition polymer obtained by polymerizing vinyl chloride at 52 °C and 9 atmospheric pressure.

$$nCH_2=\overset{\overset{Cl}{|}}{C}H \longrightarrow -CH_2\text{-}(\overset{\overset{Cl}{|}}{C}H\text{-}CH_2)_{n-1}\text{-}\overset{\overset{Cl}{|}}{C}H-$$

19. What are polyamide resins? Give an example.

Ans: These resingsare formed by the condensation of polyamines with adipicdicarboxylic acid. One of the most famous condensation polymers discovered is Nylon.

$$nOH\text{-}\overset{\overset{O}{\|}}{C}(CH_2)_4-\overset{\overset{O}{\|}}{C}OH+nH_2N(CH_2)_6NH_2 \xrightarrow{Heat,-H_2O}$$

Adipic acid Hexamethylenediamine

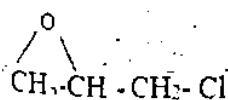
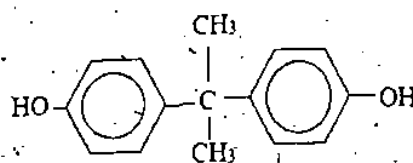
$$-\overset{\overset{O}{\|}}{C}(CH_2)_4-\overset{\overset{O}{\|}}{C}[HN(CH_2)_6NH\overset{\overset{O}{\|}}{C}(CH_2)_4\overset{\overset{O}{\|}}{C}]_{n-1}NH(CH_2)_6NH-$$

Nylon-6,6

20. Write structures of epichlorohydrin and diphenylol propane.

Ans:

$$\overset{\overset{O}{/\ \backslash}}{CH_2\text{-}CH}\text{-}CH_2\text{-}Cl$$

Epichlorohydrin

$$HO-C_6H_4-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-C_6H_4-OH$$

Diphenylolpropane

Topic No: 14.6.2

21. What is the difference between glucose and fructose? (2 times)

Ans: Glucoseconsists of aldehyde group and also called dextrose, grape sugar or blood sugar, occurs naturally in both combined and free states. In the free state, it is present in most sweet fruits and in honey. Small quantities of glucose are also preset in human blood and urine.

Fructoseconsists of ketone group and is also found in combined and free states. It is used as a sweetening agent in confectionery and as a substitute of cane sugar.

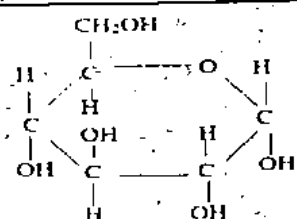
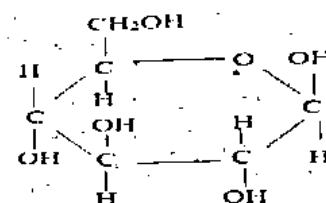
22. Give the classification of carbohydrates along with an example?

Ans: (i).. Monosaccharides:
For example: Glucose, fructose, glactose and mannose.

(ii).. Disaccharides or Oligosaccharides:
For example: Sucrose, lactose, maltose.

(iii).. Polysaccharides;
For example: Starch , cellulose and glycogen.

23. Write down the formulas for α-D-Glucose and β-D Glucose?

Ans: **Formulas for α-D-Glucose and β-D Glucose:-**

α-D-Glucose β-D-Glucose

24. Compare structures of glycogen and amylopectin?

Ans: **Structures of glycogen:** Glycogen has 1→4 and 1→6 glycosidic linkage. Glycogen on hydrolysis gives glucose units.

Structures of amylopectin: Amylopectin is polymer of α-D-Glucose and has 1→6 glycosidic linkage.

25. What is Glycogen?

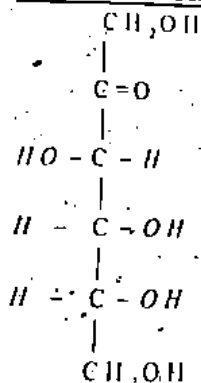
Ans: It occurs mainly in the liver and muscles where it represents the main storage polysaccharide in the same way as starch functions in plant cells. Glycogen is therefore, also called animal starch. Its structure closely resembles with that of amylopectin having 1→4 and 1→6 glycosididc linkages. Human glycogen is a much more branched molecule than amylopectin. On hydrolysis it yields glucose units.

26. Define monosaccharides and give an example?

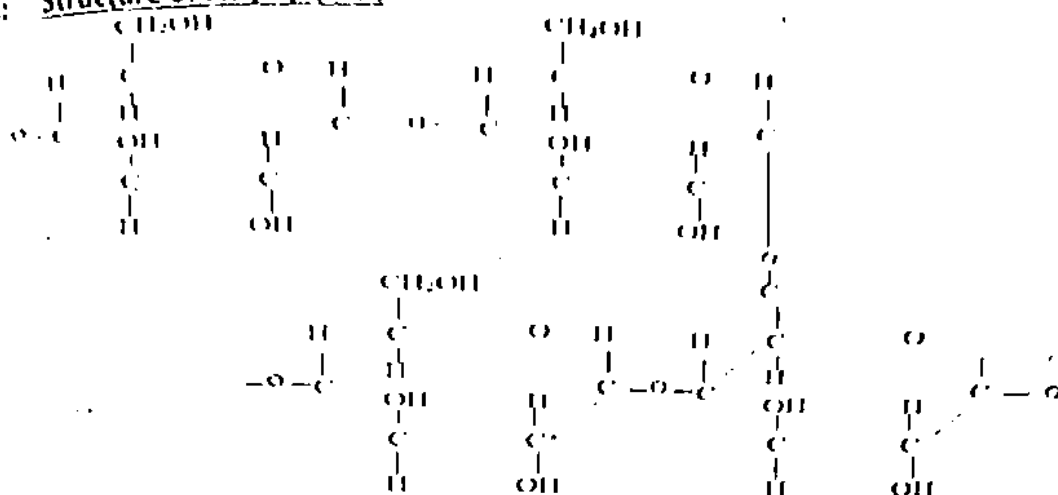
Ans: The carbohydrates having empirical formula $(CH_2O)_n$ where n=3 or some larger number are called monosaccharides. Monosaccharides are either aldoses (aldehydic group) or ketoses (ketonic group). Common examples are glyceraldehyde, glucose, fructose etc.

27. Derive the open chain structure of fructose.

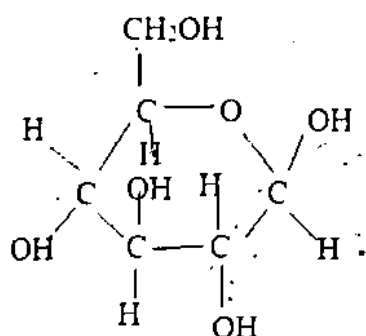
Ans: **Open chain structure of fructose:**

CH_2OH
|
C=O
|
HO – C – H
|
H – C – OH
|
H – C – OH
|
CH_2OH

Fructose (Open chain form)

28. Write the structure of amylopectin. **(2 times)**

Ans: **Structure of amylopectin:**

Structure of Amylopectin

29. Draw two cyclic forms of glucose.

Ans:

Topic No: 14.6.4

30. Briefly describe the simple proteins?

Ans: These proteins on hydrolysis yield only amino acids or their derivatives. For example, albumins, globulins, legumin, collagen, etc. globulins are insoluble in water but soluble in dilute salt solutions. They are found in animals, e.g; lactoglobulin is found in muscles and also in plants. Legumin and collagen proteins are present in the connective tissues throughout the body. They are the most abundant proteins in the animal kingdom forming some 25 to 35% of body protein.

31. What are Derived Proteins ? Give examples. **(2 times)**

Ans: They are the hydrolytic products of the above mentioned compounds. Sterols vitamin D and terpenes belong to this class of lipids.

32. Name different types of proteins on the basis ofphysico-chemical properties.

Ans: Based on physic-chemical properties, proteins may be classified into three types.

1. Simple proteins 2. Compounds or conjugated proteins 3. Derived proteins

Topic No: 14.6.6

33. Explain denaturation of protein? **(4 times)**

Ans: The structure of proteins can be disrupted easily by heat, change in pH and under strongly oxidizing or reducing conditions. Under such conditions the proteins undergo denaturation. The most familiar example of denaturation is the change that takes place in albumin, the principal component of egg white, when it is cooked. In this particular case the change is irreversible.

Topic No: 14.6.7

34. List four important uses of proteins? **(3 times)**

Ans: (i) Proteins take an essential part in the formation of protoplasm which is the essence of all form of life.

(ii) Nucleoproteins which are complexes of proteins with nucleic acids sever as carriers of heredity from one generation to the other.
(iii) Enzymes which are biological catalysts are protein in nature. Without, them life is not possible.
(iv) Many proteins have specialized functions. Haemoglobin acts as a carrier of O_2. Some proteins act as hormones which have regulatory functions, for example; insulin, thyroxine etc.

35. What is the importance of proteins? **(2 times)**

Ans: (i).. Proteins take an essential part in the formation of protoplasm which is the essence of all form of life.
(ii).. Nucleoproteins which are complexes of proteins with nucleic acids serve as carriers of heredity from one generation to the other.
(iii).. Enzymes which are biological catalysts are protein in nature. Without them life is not possible.
(iv).. Many proteins have specialized functions. Haemoglobin acts as a carrier of O_2. Some proteins act as hormones which have regulatory functions, for example; insulin, thyroxine etc.

Topic No: 14.6.8

36. Define lipids and give their types? **(2 times)**

Ans: Lipids (Greek, lipos mean fat) are naturally occurring organic compounds of animals and plants origin which are soluble in organic solvents and belong to a very heterogeneous group of substances.

Types of lipids:
(i).. Simple lipids (ii).. Compounds lipids (iii).. Derived lipids.

37. What are lipids? Give two physical properties?

Ans: Lipids (Greek, lipos mean fat) are naturally occurring organic compounds of animals and plants origin which are soluble in organic solvents and belong to a very heterogeneous group of substances.

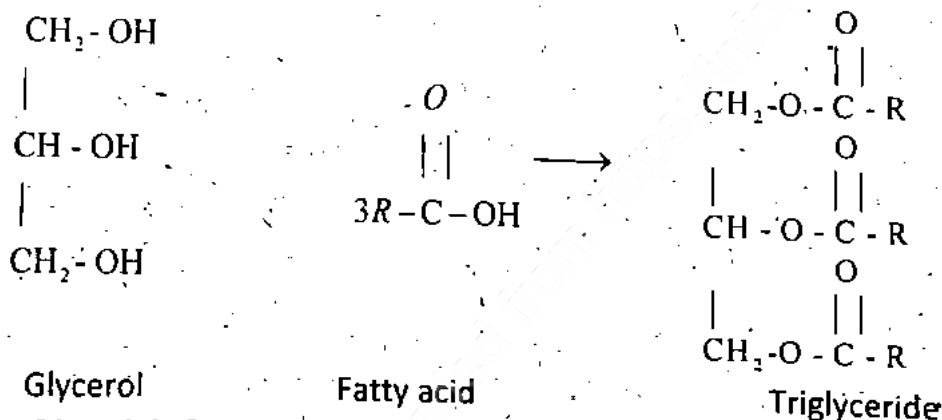
Physical properties of Lipids:
(i).. Lipids are insoluble in water and soluble in non-polar solvents e.g. ether, chloroform and benzene, etc.
(ii).. Their primary building blocks are fatty acids, glycerol and sterols.
(iii)..Lipids are utilized by the living organisms.

Topic No: 14.6.10

38. What are triglycerides? Give an example.

Ans: **Triglycerides:**
A triester of glycerol is called a triglyceride or glyceride . For example:

$$\begin{array}{l} CH_2-OH \\ | \\ CH-OH \\ | \\ CH_2-OH \end{array} \quad + \quad 3R-\overset{\overset{O}{||}}{C}-OH \longrightarrow \begin{array}{l} CH_2-O-\overset{\overset{O}{||}}{C}-R \\ | \\ CH-O-\overset{\overset{O}{||}}{C}-R \\ | \\ CH_2-O-\overset{\overset{O}{||}}{C}-R \end{array}$$

Glycerol Fatty acid Triglyceride

Topic No: 14.6.13

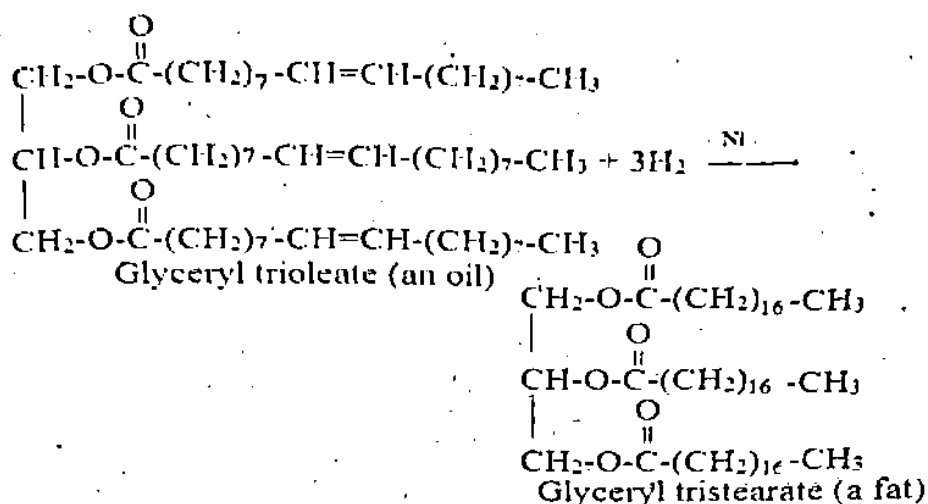
39. Interpret hardening of oil with example? **(6 times)**

Ans: Unsaturated glycerides react with hydrogen in the presence of a metal catalyst to give saturated glycerides. The result is the conversion of a liquid glyceride (an oil) into a semi-solid glyceride (a fat). This reaction is used commercially to harden vegetable oils for the production of vegetable ghee or margarine. Hardened oils are also extensively used for making soaps and candles.

$$\begin{array}{l} CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_7-CH=CH-(CH_2)_7-CH_3 \\ | \\ CH-O-\overset{O}{\overset{||}{C}}-(CH_2)_7-CH=CH-(CH_2)_7-CH_3 + 3H_2 \xrightarrow{Ni} \\ | \\ CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_7-CH=CH-(CH_2)_7-CH_3 \end{array}$$

Glyceryl trioleate (an oil)

$$\begin{array}{l} CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_{16}-CH_3 \\ | \\ CH-O-\overset{O}{\overset{||}{C}}-(CH_2)_{16}-CH_3 \\ | \\ CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_{16}-CH_3 \end{array}$$

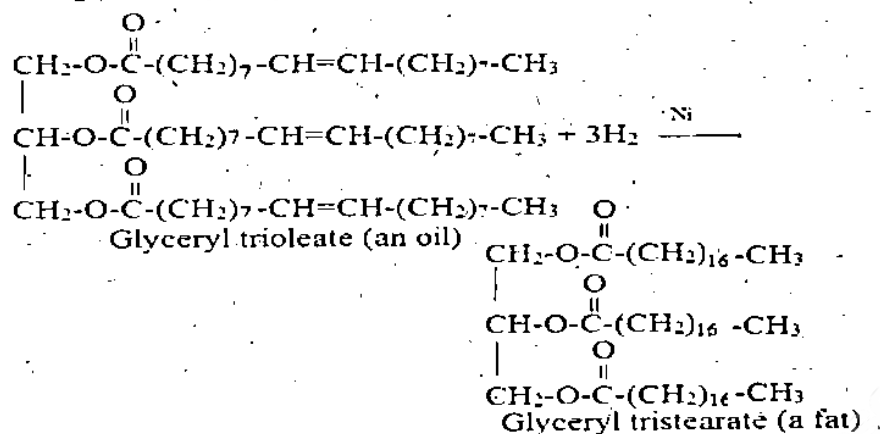
Glyceryl tristearate (a fat)

40. Give two differences between Oils and Fats? (5 times)

Ans: (i).. Oils are unsaturated and fats are saturated compounds. Unsaturated glycerides react with hydrogen in the presence of a metal catalyst to give saturated glycerides. The result is the conversion of a liquid glyceride (an oil) into a semi-solid glyceride (a fat).

$$\begin{array}{l} CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_7-CH=CH-(CH_2)_7-CH_3 \\ | \\ CH-O-\overset{O}{\overset{||}{C}}-(CH_2)_7-CH=CH-(CH_2)_7-CH_3 + 3H_2 \xrightarrow{Ni} \\ | \\ CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_7-CH=CH-(CH_2)_7-CH_3 \end{array}$$

Glyceryl trioleate (an oil)

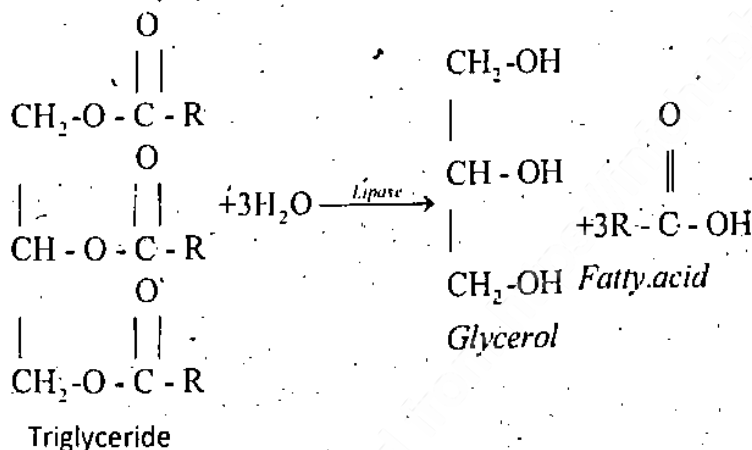
$$\begin{array}{l} CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_{16}-CH_3 \\ | \\ CH-O-\overset{O}{\overset{||}{C}}-(CH_2)_{16}-CH_3 \\ | \\ CH_2-O-\overset{O}{\overset{||}{C}}-(CH_2)_{16}-CH_3 \end{array}$$

Glyceryl tristearate (a fat)

(ii).. Oils have low melting points and fats have high melting points.

41. What happens when the hydrolysis of triglyceride is carried out?

Ans: Triesters are easily hydrolysed by enzymes called lipases to fatty acids and glycerol.

$$\begin{array}{l} CH_2-O-\overset{O}{\overset{||}{C}}-R \\ | \\ CH-O-\overset{O}{\overset{||}{C}}-R \\ | \\ CH_2-O-\overset{O}{\overset{||}{C}}-R \end{array} + 3H_2O \xrightarrow{Lipase} \begin{array}{l} CH_2-OH \\ | \\ CH-OH \\ | \\ CH_2-OH \end{array} + 3R-\overset{O}{\overset{||}{C}}-OH$$

Triglyceride   *Glycerol*   *Fatty acid*

Topic No: 14.6.14

42. Define saponification number and iodine number? (24 times)

Ans: **Saponification number:** It is defined as the number of milligrams of potassium hydroxide or sodium hydroxide required to saponify one gram of the fat or oil. For example, one mole of glycerol tripalntate (mol.wt=807) requires 168,000 mg of KOH for saponification. Therefore, one gram of fat will require 168000/807 mg of KOH. Hence the saponification number of glycerol tripalmitate is 208.

<u>Iodine number:</u>The extent of unsaturation in a fat or an oil is expressed in terms of its iodine number. It is defined as the number of garms of iodine which will add to 100 grams of a fat or an oil. The value of iodine number depends on the number of double bonds present in the acid component of the glycerides. The glycerides with no double bonds have zero iodine number.

43. What is meant by saponification number? Give an example.

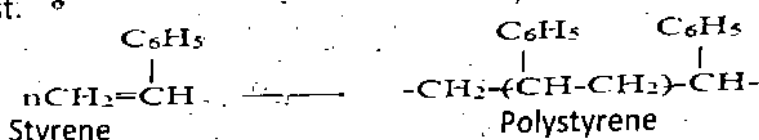
Ans: <u>Saponification number:</u>It is defined as the number of milligrams of potassium hydroxide or sodium hydroxide required to saponify one gram of the fat or oil.

<u>Example:</u>One mole of glycerol tripalmitate (mol.wt=807) requires 168,000 mg of KOH for saponification. Therefore, one gram of fat will require 168000/807 mg of KOH. Hence the saponification number of glycerol tripalmitate is 208.

44. How polystyrene is prepared?

Ans: Polystyrene is prepared by the polymerization of styrene in the presence of a catalyst.

$$nCH_2=CH(C_6H_5) \longrightarrow -CH_2-(CH(C_6H_5)-CH_2)-CH(C_6H_5)-$$

Styrene Polystyrene

Topic No: 14.15

45. What is Rancidity of fats or oils? (6 times)

Ans: Fats or oils are liable to spoilage and give off an odour known as rancidity. It is mainly caused by the hydrolytic or oxidative reactions which release foul smelling aldehydes and fatty acids. Oils form sea animals which contain a relatively high proportion of unsaturated acid chains deteriorate rapidly.

Topic No: 14.17

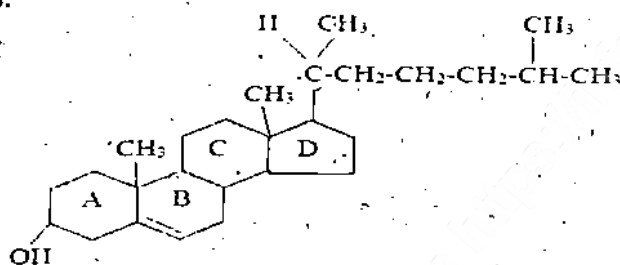
46. Define acid number. (4 times)

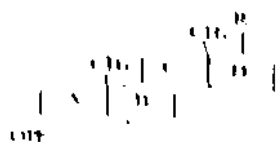
Ans: The acid number of a fat or an oil tells the amount of free fatty acids present in it. It is expressed as the number of milligrams f potassium hydroxide required to neutralize one gram of fat.

Topic No: 14.18

47. Write a note on Cholesterol. (2 times)

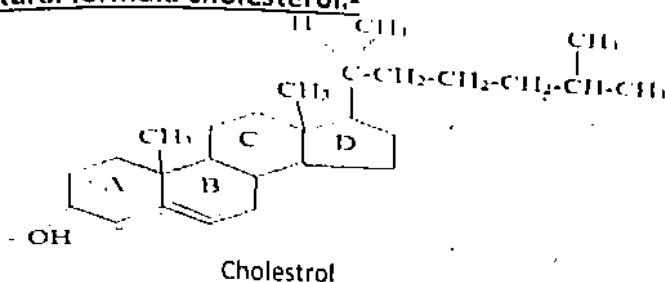
Ans: It is the most abundant animal sterol and occurs in all animal tissues but only in a few higher plants. Cholesterol is present both in the free as well as esterified form in the blood, animal tissues, egg and yolk, various oils and fats and nerve tissues.

H CH3 CH3
C-CH2-CH2-CH2-CH-CH3
CH3
CH3 C D
A B
OH

48. What are steroids? Define with an example.

Ans: Steroids are naturally occurring lipids. Their parent nucleus has perhydrocyclopentanophenanthrene component which consists of three six-membered rings: (A,B and C) and one five – membered ring (D). these rings are joined or fused to each other and have a total of 17-C atoms. Very small variations in the bonding of atoms in the ring and in the groups attached to them give rise to compounds that are remarkably diverse in their biological functions. Some of the natural occurring compounds belonging to steroids are cholesterol, ergosterol, male and female sex hormones and the hormones of the adrenal cortex.

Structure of steroid nucleus.

49. **Write down the structural formula cholesterol?** **(5 times)**

Ans: **Structural formula cholesterol:-**

Cholestrol

Topic No: 14.19

50. **Write down important uses of Lipids?** **(5 times)**

Ans: (i) Lipids are good source of energy and make the food more palatable.
(ii) Lipids exert an insulating effect on the nervous tissues.
(iii) Lipids are good energy reservoirs in the body.
(iv) Lipids are an integral part of cell protoplasm and cell membranes.
(v) Some lipids act as precursors of very important physiological compounds. For example, cholesterol is the precursor of steroid hormones.

Topic No: 14.20

51. **Define enzyme. Name their two properties?** **(2 times)**

Ans: Enzyme-:The reaction catalyst of biological systems produced by living cells and are capable of catalyzing chemical reactions are called enzymes.

Properties of enzymes:

(i).. Enzymes are proteins or contain proteins as essential components and in addition require non-protein components which are also essential for their activity.

(ii).. Many enzymes contain vitamins as their co-factors, for example; nicotinamide adenine dinucleotide contain nicotinamide vitamin.

Topic No: 14.22

52. **Give four properties of enzymes?** **(2 times)**

Ans: (i).. **Specificity:**Enzymes are specific in their action which means that an enzyme will act on only one substrate or a group of closely related substrates. For example hexokinase catalyses conversion of hexose like glucose fructose & mannose to their 6 phosphate derivatives but glucokinase is specific for glucose only.

(ii).. **Protein nature:**Enzymes with few exceptions are protein in nature. They are produced by living cells but act *in vivo* as well as *in vitro*.

(iii).. **The direction of enzyme reactions:** Most enzymatic reactions are reversible i.e. the same enzyme can catalyze reactions in both directions.

(iv).. **Isoenzymes**These are the enzymes form the same organism which catalyze same reaction but are chemically and physically distinct from each other.

53. **Write the factors which affect the enzyme activity?** **(2 times)**

Ans: (i).. Enzyme concentration. (ii).. Temperature.
(iii).. Effect of pH. (iv).. Coenzymes, activators and inhibitors.
(v).. Radiation.

54. What is chemical nature of enzyme? Classify them. (2 times)

Ans: Enzymes are either pure proteins or contain proteins as essential components and in addition require non protein components which are also essential for their activity. The protein components of the enzyme is called apoenzyme and the non protein component is called co factor or coenzyme the co factors include inorganic ions and complex organic or metallo organic molecules. Important inorganic co-factor along with their respective enzymes include Fe^{+2} (chrome oxidase) Zn^{+2} (carbonic anhydrase) and Mg^{+2} (glucose 6 phosphatase).

Classification of enzymes:

(i). Oxidoreductases(ii). Transferases(iii). Hydrolases
(iv). Lyases(v). Isomerases(vi). Ligases

55. What are the following? (a) Isoenzyme (b) Nucleotide

Ans: **(a)Isoenzymes:** These are the enzymes form the same organism which catalyze same reaction but are chemically and physically distinct from each other.

(b)Nucleotide: Both DNA and RNA are formed by joining together a large number of nucleotide units or mononucleotides units, each of which is a nitrogenous base-sugar phosphoric acid complex.

Topic No: 14.23

56 Discuss effect of temperature and pH on enzyme activity?(2 times)

Ans: The enzymatic reaction occurs best at or around 37ºCwhich is the average normal body temperature. The rate of chemical reactions is increased by a rise in temperature but this is true only over a limited range of temperature. The enzymes usually destroy at high temperature. The activity of enzymes is reduced at low temperature. The temperature at which an enzyme reaction occurs the fastest, is called its optimum temperature.

Topic No: 14.26

57. Write any two differences between DNA and RNA? (4 times)

Ans: i..The sugar in RNA is ribose while the sugar in DNA is 2-deoxyribose.

ii. Four different bases are found in DNA cytosine (C), thymine (T), adenine (A) and guanine (G). In RNA, thymine does not occur and its place is taken by uracil (U).

58. Compare structure of DNA and RNA? (4 times)

Ans: Both DNA and RNA are formed by joining together a large number of nucleotide units or mononucleotides units, each or which is a nitrogenous base – sugar phosphoric acid complex.

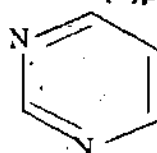
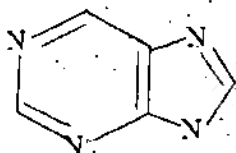
DNA carries the genetic information and RNA is involved in putting this information to work in the cell. They differ in three ways.

i.. The sugar in RNA is ribose while the sugar in DNA is 2-deoxyribose.

ii.. Four different bases are found in DNA cytosine (C), thymine (T), adenine (A) and guanine (G). In RNA, thymine does not occur and its place is taken by uracil (U).

iii.. DNA is double stranded, while RNA is usually single stranded.

59. Draw the structures of (a) purine (b)pyrimidine

Ans: **(a) purine** **(b)pyrimidine**

2018

60. What are nucleosides and nucleotides?

Ans: **Nucleosides and nucleotides:**

Nucleosides: A nucleoside is a combination of nitrogenous base(purine or pyrimidine) with a sugar (ribo or deoxyribose). Depending upon the presence of ribo or deoxyribo, nucleoside can either be a ribonucleoside or deoxyribonucleoside.

Nucleotides: Nucleotides are organic molecules that serve as the monomer units for forming the nucleic acid polymer DNA or RNA. DNA carries the genetic information and RNA is involve in putting this information to work in the cell.

2019

61. What are polysaccharides.

Ans: **Polysaccharides:**

These are carbohydrates of high molecular mass which yield many monosaccharide molecules upon hydrolysis.

Examples: starch, cellulose

62. Write down names of two enzymes used in diagnosis of diseases.

Ans: (i) Alkaline Phosphatase is raised in rickels.

(ii) Lactic dehydrogenase or LDH–1 is raised in heart diseases.

63. What are characters of Lipids?

Ans: Following are characteristics of lipids.

(i) Insoluble in water and soluble in non-polar solvents.

(ii) Their primary building blocks are fatty acids, glycerol, sterols.

(iii) They are utilized by living organisms.

64. Give difference between starch and cellulose.

Ans: Starch is polymer of α – D – Glucose units.

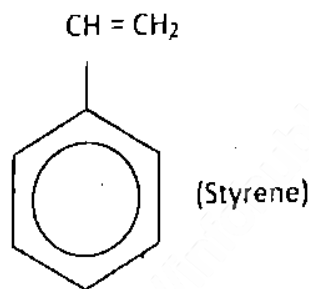
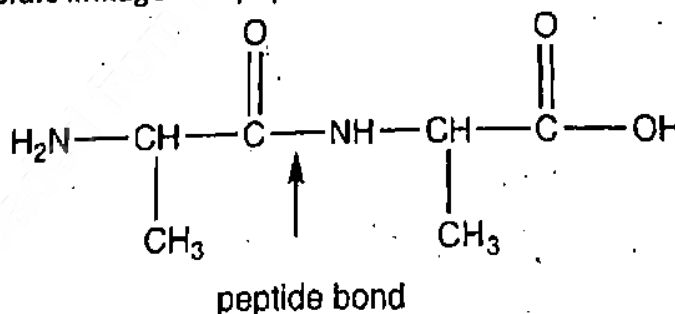
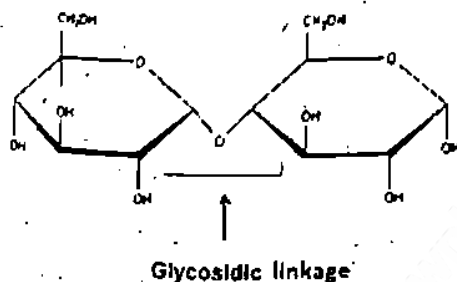
Cellulose is polymer of β – D – Glucose units.

65. Give repeating unit each of (a) Polysterene

(a) Polysterene (b) Teflon

Ans:

Polysterene

Teflone $CF_2 = CF_2$ (Tetrafluoroethylene)

66. Differentiate between glycosidic linkage and peptide linkage.

67. How radiations affect activity of enzymes.

Ans: Generally enzymes are readily deactivated by exposure of U.V or β – rays.

68. Why is cellulose not digested by human intestinal track.

Ans: Due to absence of cellulase enzyme in human track, cellulose is not digested.

CHAPTER NO:15
COMMON CHEMICAL INDUSTRIES IN PAKISTAN
OBJECTIVES (MCQ'S)
IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 15.2

1. Which three elements are needed for the healthy growth of plants? (8 times)
(a) N, S, P (b) N, Ca, P (c) N, P, K (d) N, K, C

Topic No: 15.3

2. Micro- nutrients are required in quantity per acre ranging from: (7 times)
(a) 4-40 g (b) 6-200 g (c) 6-200 kg (d) 4-40 kg

Topic No: 15.4.1

3. The nitrogenous fertilizer easily taken up by plants is: (5 times)
(a) Urea (b) Ammonium nitrate (c) Ammonia gas (d) Ammonia liquid

4. Ammonium nitrate is not used as fertilizer for which crop? (11 times)
(a) Cotton (b) Wheat (c) Sugar Cane (d) Paddy rice

5. The nitrogen present in some fertilizers helps plants: (2 times)
(a) Fight against diseases (b) Produces fat (c) Undergo photosynthesis (d) Produce protein

Topic No: 15.4.2

6. Phosphorous helps in growth of: (4 times)
(a) Roots (b) Leaves (c) Stems (d) Seed

Topic No: 15.5

7. The percentage of lime (CaO) in Portland cement is:
(a) 1.0 (b) 2.5 (c) 62 (d) 60

Topic No: 15.5.2

8. Which is not a Calcarious material? (6 times)
(a) Lime (b) Clay (c) Marble (d) Marine Shell

Topic No: 15.5.3

9. Which is not a calcarious material? (2 times)
(a) Clay (b) Lime stone (c) Marble (d) Chalk

10. Argillaceous material in the following is: (2 times)
(a) Lime (b) Clay (c) Marble (d) Marine shell

Topic No: 15.5.5

11. The number of zones through which the charge passes in a rotary kiln is (5 Times)
(a) 4 (b) 3 (c) 2 (d) 5

12. During manufacturing process of cement, the temperature of decomposition zones goes upto: (2 Times)
(a) 800°C (b) 900°C (c) 1000°C (d) 1100°C

Topic No: 15.6.1

13. The word paper is derived from the name of which ready plant? (2 times)
(a) Rose (b) Sun flower (c) Papyrus (d) Water hyacinth

Topic No: 15.6.5

14. Woody raw material of paper pulp is obtained from: (4 times)
(a) Cotton (b) Bagasse (c) Poplar (d) Rice straw

15. Calendar stack is the stage of paper making where?
(a) Paper is stored (b) Thickness is reduced (c) Water is removed (d) Stock is reduced to 1%

Topic No: 15.6.6

16. Newspaper can be recycled again and again for how many times. (18 times)
(a) 5 (b) 4 (c) 3 (d) 2

2021

17. All the nitrogen fertilizers except ________ make the soil acidic.
(a) Calcium nitrate (b) Ammonium nitrate (c) Potassium nitrate (d) All these

18. Most concentrated solid nitrogen fertilizer is:
(a) NH_3 (b) $(NH_4)_2HPO_4$ (c) $(NH_2)_2CO$ (d) NH_4NO_3

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10
C	B	A	D	D	D	C	B	A	B
11	12	13	14	15	16	17	18		
A	B	C	C	B	A	D	C		

CHAPTER NO:15 SHORT QUESTIONS COMMON CHEMICAL INDUSTRIES IN PAKISTAN IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 15.2

1 What are fertilizers? Why are they needed? **(2 times)**

Ans: Fertilizers are the substances added to soil to make up the deficiency of essectial elements like nitrogen, phosphorus and potassium (NKP) required for the proper growth of plants. Fertilizers enhance the natural fertility of the soil or replenish the chemical elements taken up from soil by the previous crops.

2 Distinguish between fertilizer and non-fertilizer compounds?

Ans: Compounds of elements namely nitrogen, phosphorus, and potassium are considered to be the most important nutrients essential for plants growth. The elements like sulphure, magnesium and calcium are considered of secondary importance. These compounds are called fertilizer compounds.

While those compounds which are not required as nutrients for a fertilizer is called non-fertilizer compounds.

3 What are fertilizers and why they are required? **(4 times)**

Ans: Fertilizers:-Fertilizers are the substances added to the soil to make up the deficiency of essential elements like nitrogen, phosphorus and potassium required for the proper growth of plants. Fertilizers enhance the natural fertility of the soil or replenish the chemical elements taken up from soil by the previous crops.

Topic No: 15.3

4 Classify elements essential for plant growth? **(4 times)**

Ans: Compounds of elements namely nitrogen, phosphorus, and potassium are considered to be the most important nutrients essential for plants growth. The elements like sulphure, magnesium and calcium are considered of secondary importance.

5 Distinguish micronutrients and macronutrients for plants? **(21 times)**

Ans: Micronutrients: The nutrients which are required in a very small amount for the growth of plant, are called micro-nutrients. These include, Boron, Copper, Iron, Manganese, Zinc, Molybdenum and Chlorine.

Macronutrients: The nutrients which are required in a large amount for the growth of plants, are called macro-nutrients. These include Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur, Carbon, Hydrogen and Oxygen. These are generally required in quantities ranging from 5 Kg to 200 Kg per acre.

6 What important qualities of a good fertilizer? **(21 times)**

Ans: Important qualities of a good fertilizer:-

(i).. The nutrient elements present in it must be readily available to the plant.
(ii).. It must be fairly soluble in water so that it thoroughly mixes with the soil.
(iii).. It should not be injurious to plant.
(iv).. It should be cheap.
(v).. It must be stable so that it is available for a longer time to the growing plant.
(vi).. It should not alter the pH of the soil.
(vii).. By rain or water, it should be converted into a form, which the plant can assimilate easily.

7 Give the important properties of Fertilizers?

Ans: Important properties of Fertilizers:-

(i).. The nutrient elements present in it must be readily available to the plant.
(ii).. It must be fairly soluble in water so that it thoroughly mixes with the soil.
(iii).. It should not be injurious to plant.
(iv).. It should be cheap.
(v).. It must be stable so that it is available for a longer time to the growing plant.
(vi).. It should not alter the pH of the soil.
(vii).. By rain or water, it should be converted into a form, which the plant can assimilate easily.

Topic No: 15.4

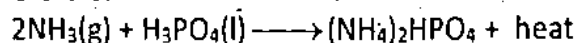
8 Enlist steps involved in the manufacture of urea? (2 Times)

Ans: Urea is produced by the reaction of liquid ammonia with gaseous carbon dioxide. Following steps are involve in the manufacture of urea.

(i).. Preparation of hydrogen (ii).. Preparation of ammonia
(iii).. Preparation of Ammonium Carbamate (iv).. Preparation of urea
(v).. Concentration of Urea (vi).. Prilling

9 Write a note on diammonium phosphate? / How diammonium phosphate is prepared? (2 Times)

Ans: This compound of fairly high purity is prepared by continuous process that consists of reacting anhydrous ammonia gas and pure phosphoric acid at 60-70C and pH 5.8-6.0.

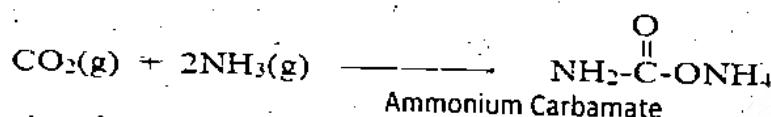
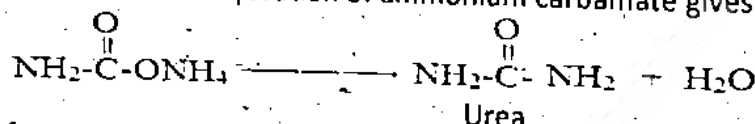
$$2NH_3(g) + H_3PO_4(l) \longrightarrow (NH_4)_2HPO_4 + \text{heat}$$

It is an exothermic reaction. The heat of reaction vaporized water from the liquor and the crystals of diammonium phosphate are taken out, centrifuged, washed and dried. It contains 16% nitrogen and 48% PO_5. This product contains about 75% plant nutrients and is deemed suitable for used either alone or in mixed with other fertilizers.

10 Give reactions of preparation of urea by using NH_3 and CO_2 (2 times)

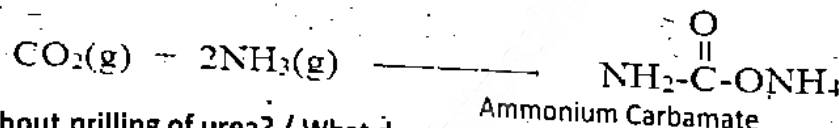
Ans: **Preparation of Ammonium Carbamate:** Gaseous carbon dioxide is mixed with ammonia in the volume ratio of 1:2 in a reactor to produce ammonium carbamate.

$$CO_2(g) + 2NH_3(g) \longrightarrow \underset{\text{Ammonium Carbamate}}{NH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}ONH_4}$$

Preparation of Urea: Dehydration of ammonium carbamate gives urea.

$$NH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}ONH_4 \longrightarrow \underset{\text{Urea}}{NH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2} + H_2O$$

11 What is formed when liquid NH_3 and CO_2 react with each other?

Ans: **Reaction of liquid NH_3 and CO_2:-**

$$CO_2(g) + 2NH_3(g) \longrightarrow \underset{\text{Ammonium Carbamate}}{NH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}ONH_4}$$

12 Brief about prilling of urea? / What do you mean by grilling of urea? (5 times)

Ans: The molten urea is sprayed at the prilling tower by means of prilling bucket where it is cooled by the air rising upward. Molten droplets solidify into the form of prills. Urea prills thus produced are either sent to the bagging section or to the bulk storage.

13 Write down formulas for Superphosphate and triple phosphate? (2 times)

Ans: Superphosphate: $Ca(H_2PO_4)_2$
Triple phosphate: $(NH_4)_2HPO_4$

14 Ammonium nitrate cannot be used as a fertilizer for paddy rice? Summarize with reason?

Ans: Ammonium nitrate cannot be used as a fertilizer for paddy rice because the microbial bacteria in flooded fields decomposes it to nitrogen gas.

15 Ammonium nitrate is a useful fertilizer for many crops except paddy rice. Why?

Ans: Ammonium nitrate cannot be used as a fertilizer for paddy rice because the microbial bacteria in flooded fields decomposes it to nitrogen gas.

16 Give percentage of nitrogen in Urea ,Ammonium nitrate, Diammonium hydrogen phosphate and KNO_3?

Ans: <u>Percentage of nitrogen:-</u>

Percentage of nitrogen in Urea = 46%
Percentage of nitrogen in Ammonium nitrate =33-33.5%
Percentage of nitrogen in Diammonium hydrogen phosphate = 16%
Percentage of nitrogen in KNO_3= 13%

17 Explain the importance of potassium fertilizer? (3 times)

Ans: <u>Importance of potassium fertilizer:-</u>

Potassium fertilizers provide potassium to the plant or soil. Potassium is required for the formation of starch, sugar and the fibrous material of the plant. They increase resistance to diseases and make the plants strong by helping in healthy root development. They also help in ripening of seeds, fruits and cereals. Potassium fertilizers are especially useful for tobacco, coffee, potato and corn.

18 How urea is manufactured?Write its reactions. / Write the reactions involved in preparation of urea fertilizer. (3 times)

Ans: <u>Manufactured or Urea:-</u>

Urea is produced by the reaction of liquid ammonia with gaseous carbon dioxide. Following steps are involved in the manufacture of urea.

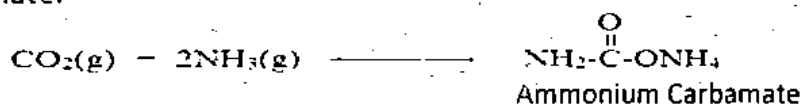
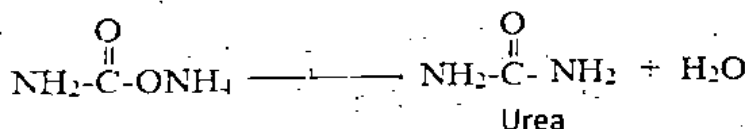
(i).. Preparation of hydrogen (ii).. Preparation of ammonia
(iii).. Preparation of Ammonium Carbamate (iv).. Preparation of urea
(v).. Concentration of Urea (vi).. Prilling

Preparation of Ammonium Carbamate: Gaseous carbon dioxide is mixed with ammonia in the volume ratio of 1:2 in a reactor to produce ammonium carbamate.

$$CO_2(g) - 2NH_3(g) \longrightarrow NH_2\text{-}\overset{\overset{O}{\parallel}}{C}\text{-}ONH_4$$

Ammonium Carbamate

Preparation of Urea: Dehydration of ammonium carbamate gives urea.

$$NH_2\text{-}\overset{\overset{O}{\parallel}}{C}\text{-}ONH_4 \longrightarrow NH_2\text{-}\overset{\overset{O}{\parallel}}{C}\text{-}NH_2 + H_2O$$

Urea

Concentration of Urea Solution:-

The urea solution is concentrated in an evaporation section where water is evaporated by heating with steam under vacuum in two evaporation stages whereby 99.7% urea melt is obtained. It is then pumped to prilling tower.

Prilling:-

The molten urea is sprayed at the prilling tower by means of prilling bucket where it is cooled by the air rising upward. Molten droplets solidify into the form of prills. Urea prills thus produced are either sent to the bagging section or to the bulk storage.

19 Why nitrogen is important for plants? / Why nitrogen is important for plants? Give two name of nitrogenous fertilizers. / Briefly describe the role of nitrogen in plants. / What is the function of Nitrogenous Fertilizers for the Growth of Plants? / What are nitrogeneous fertilizers ? Give two examples. (5 Times)

Ans: <u>Importance of nitrogen for plants:-</u>

Nitrogen is required during the early stage of plant growth for the development of stems and leaves. It is the main constituents of protein, imparts green colour to the leaves and enhance the yield and quality of the plants.

20. What is the function of phosphatic fertilizers in plants? / Give two benefits of Phosphatic fertilizers. (2 Times)

Ans: <u>Function of phosphatic fertilizers in plants:</u>

Phosphorus is required to stimulate early growth, to accelerate the seed and fruit formation during the later stages of growth. It also increases resistance to diseases. The various phosphatic fertilizers have different composition due to which they have different solubilities .

21. What are phosphatic fertilizers? Give two formulas of phosphatic fertilizers. (13 times)

Ans: **Phosphatic fertilizers:**
The fertilizers provide phosphorus to the plants or soil. Various phosphate fertilizers have different compositions. The most important water soluble fertilizers are super phosphate (calcium super phosphate) $Ca(H_2PO_4)_2$. and triple phosphate (diammonium – phosphate $(NH_4)_2HPO_4$).

22 What is the role of K(potassium) in growth of plant?

Ans: Potassium is required for the formation of starch, sugar and the fibrous material of the plant. They increase resistance to disease and make the plants strong by helping in healthy root development. They also help in ripening of seeds, fruits and cereals. Potassium fertilizers are especially useful for tobacco, coffee, potato and corn.

Topic No: 15.5

23 What is the difference between clinker and cement? (2 times)

Ans: **Clinker:** The resulting product obtained from the kiln is known as cement clinker. This has the appearance of greenish black or grey coloured balls varying in size from small nuts to peas.

Cement: Cement is the material obtained by burning an intimate mixture of calcareous and argillaceous materials at sufficiently high temperature to produce clinkers. These clinkers are then ground to a fine powder.

24 Give different zones in the rotary kiln and their temperature. (2 times)

Ans:
(a).. Drying or pre-heating zone (minimum temperature zone)
(b).. Decomposition zone (Moderate temperature zone)
(c).. Burning zone (Maximum temperature zone)
(d).. Cooling zone

25 Give an idea about clinker? (3 times)

Ans: The resulting product obtained from the kiln is known as cement clinker. This has the appearance of greenish black or grey coloured balls varying in size from small nuts to peas.

26 What are the prospect of the cement industry in Pakistan?

Ans: At the time of partition in 1947 , there were four cement plants in West Pakistan, which produced about 330,000 tons of cement every year. However in 1954 the production of cement went up to 660,000 tons, in 1956 two more cement factories were set up at DaudKhel and Hyderabad, but even then the production of cement was not enough to meet the increasing demand of the construction industry in the country.

For a developing country like Pakistan there is always an increasing need of cement for development projects. Efforts were thus made to build more factories. At present there are about 22 cement factories in private as well as in public sectors, which are manufacturing cement both by dry and wet process. The total production of these 22 cement plants is 9,578,802 tons/annum.

27 Define cement. Give its essential components? (10 times)

Ans: **Cement and its essential components:-**
Cement is the material obtained by burning an intimate mixture of calcarious and argillaceous materials at sufficiently high temperature to produce clinkers. These clinkers are then ground to a fine powder.

Essential components of cement:-
(i).. Calcarious material (limestone, marble, chalks, marine shell) as source of CaO.
(ii).. Argillaceous material (clay, shale, slate, blast furnace slag) they provide acidic components such as aluminates and silicates..
(iii).. Gypsum.

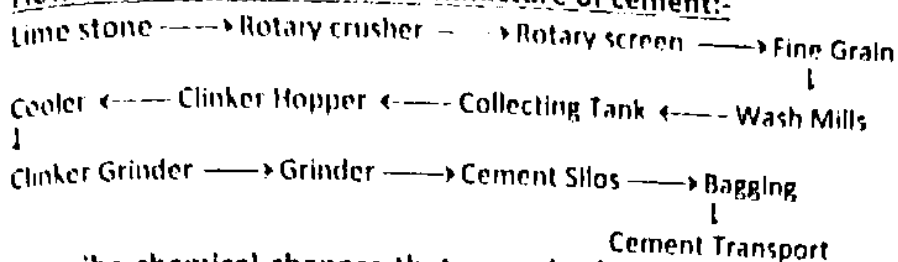
28 What reactions are taking place in the first 24 hours during setting of cement? (3 times)

Ans: **Reactions taking place in the first 24 hours:-**
A short time after the cement is mixed with water, tri-calcium aluminate absorbs water (hydration) and forms a colloidal gel of the composition, $3Ca.Al_2O_3.6H_2O$(tricalcium aluminate).

The gel starts crystallizing slowly, reacts with gypsum ($CaSO_4.2H_2O$) to form the crystals of calcium sulpho-aluminate ($3Ca.Al_2O_3.3CaSO_4.2H_2O$).

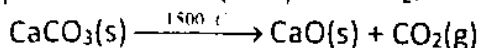
29 Draw flow sheet diagram for the manufacture of cement? (3 times)

Ans: Flow sheet diagram for the manufacture of cement:-

Lime stone ⟶ Rotary crusher ⟶ Rotary screen ⟶ Fine Grain
↓
Cooler ⟵ Clinker Hopper ⟵ Collecting Tank ⟵ Wash Mills
↓
Clinker Grinder ⟶ Grinder ⟶ Cement Silos ⟶ Bagging
↓
Cement Transport

30 Describe chemical changes that occur in the decomposition and zone's during the manufacture of cement? (4 times)

Ans: Chemical changes that occur in the decomposition and zone's:-

(a).. Drying or pre-heating Zone (minimum temperature zone)
In this zone the temperature is kept at 500ºC, wereby the moisture is removed and the clay is broken into Al_2O_3, SiO_3 and Fe_2O_3.

(b).. Decomposition Zone (Moderate temperature zone)
Here the temperature goes upto1500ºC. In this zone the limestone ($CaCO_3$) decomposes into lime (CaO) and CO_2.

$$CaCO_3(s) \xrightarrow{1500^\circ C} CaO(s) + CO_2(g)$$

(c).. Burning Zone (Maximum temperature zone)
In this zone, the temperature goes up to 1500ºC and the oxides e.g. CaO, SiO_2, Al_2O_3 and Fe_2O_3 combine together and form calcium silicate, calcium aluminate and calcium ferrite.

(d).. Cooling Zone
This is the last stage in the kiln where the charge is cooled up to 150-200ºC.

31 What do you mean by Calcarious materials and Argillaceous material used for the manufacturing of cement? / Name two Calcarious and two Arglacious raw materials for cement. (6 times)

Ans: Calcarious and Argillaceous material:-

Calcarious material:-
Calcarious material (limestone, marble, chalks, marine shell) as source of CaO.

Argillaceous material:-
Argillaceous material (clay, shale, slate, blast furnace slag) they provide acidic components such as aluminates and silicates.

32 Just write five stages involved in the manufacturing of Portland Cement? (2 times)

Ans: Stages involved in the manufacturing of Portland Cement:-

(i).. Crushing and Grinding
(ii).. Mixing of the Raw Material
(iii).. Heating the slury in a Rotary Kiln
(iv).. Clinker formation
(v).. Grinding the Clinker with Gypsum

33 What are clinkers? How are they converted into cement? (5 times)

Ans: Clinkers and its conversion into cement:-

The resulting product obtained from the kiln is known as cement clinker. This has the appearance of greenish black or grey coloured balls varying in size from small nuts to peas.

Clinkers conversion into cement:-
The cement clinkers are air cooled and ground with required amount of gypsum into fine powder.

34. Write various types of raw material used in preparation of cement.(2 times)

Ans: Raw material used in the preparation of cement:

The imoortant raw materials used ofr the manufacture of cement are:

(i). Calcarous material (limestone, marble, chalk, marine shell) as source of CaO.

(ii). Argilaceous material (Clay, shale, slate, blast furnace slag). They provide acidic components such as aluminates and silicates.

(iii). vii. Why Gypsum is used in grinding with clinkers?

35. Defien the term (a) cement (b) paper.

Ans: **Cement and paper**

Cement :It is material obtained by burning an intimate mixture of calcarious and argillaceous materals at sufficiently high temperature to produce clinkers. These clinkers are then ground to a fine powder. The essential constituents are line (obtained from limestone) silica and alumina (present in clay).

Paper: It is defined in term of its method of production, that is a sheet material made up of a network of natural cellulosic fibres which have been deposited from an aqueous suspension. The product obtained is a network of interwinningfibres.

36 What reaction takes place in the setting of cement from 01 to 07 days?(3 times)

Ans: Tricalcium silicate ($3CaO.SiO_2$) and tri-calcium aluminate ($3CaO.Al_2O_3$) get hydrolyzed to produce calcium hydroxide and aluminium hydroxide, the calcium hydroxide thus formed, starts changing into needle-shaped crystals, which get studded in the colloidal gel and impart strength to it. Amuminium hydroxide, on the other hand, fills the interstices resulting in hardening the mass. The gel formed starts losing water partly by evaporation and sets to a hard mass.

37 What do you mean by setting of cement? (2 Times)

Ans: The use of cement in the construction of buildings is based on its property of setting to a hard mass when its paste with water is allowed to stand for sometime.

38 Describe the average composition of Portland cement. (2 Times)

Ans:

Name of Compound	Percentage
Lime (CaO)	62
Silica (SiO_2)	22
Alumina (Al_2O_3)	7.5
Magnesia (MgO)	2.5
Iron oxide	2.5
Sulphur trioxide (SO_3)	1.5
Sodium Oxide(NaO)	1.0
Potassium Oxide (K_2O)	1.0

Topic No: 15.6

39 Why wet cleaning is done in paper manufacture?

Ans: Wet cleaning removes the remaining dust particles, and the soluble materials get dissolved in water.

40 Define paper. Give important raw material for the manufacture of paper? (7 times)

Ans: Paper is defined in term of its method of production, that is a sheet material made up of a network of natural cellulosic fibres which have been deposited form an aqueous suspension. The product obtained is a network of interwinningfibres.

The main raw materials used in the production of pulp and paper in Pakistan is of two types, that is non woody and woody raw materials.

Non-woody and woody raw materials:-

Nonwoody Raw Materials	Woody Raw materials
(i).. Wheat straw (ii).. Rice straw (iii).. Bagasse (iv).. Bamboo (v).. Rag (vi).. Cotton stalk	(i).. Poplar (hard wood) (ii).. Eucalyptus (hard wood) (iii).. Douglas fir (soft wood)

41 Write the names of two non-woody and two woody raw materials for the production of paper and pulp? (4 times)

Ans: **Non-woody and two woody raw materials:-**

Nonwoody Raw Materials	Woody Raw materials
(i).. Wheat straw (ii).. Rice straw (iii). Bagasse (iv).. Bamboo (v).. Rag (vi).. Cotton stalk	(i).. Poplar (hard wood) (ii).. Eucalyptus (hard wood) (iii).. Douglas fir (soft wood)

42 How digestion process is carried out in paper industry? (2 times)

Ans: **Digestion process in paper industry:-**

From wet digestion, the material is sent to digester. The digester is usually 10 meters in length and 2 meters in diameter. It is made of steel and wrought iron. This is the main unit of the process. The digestion process can be either batch or continuous.

As the raw material enters into the digester, steam is introduced at the bottom and a liquor containing sodium sulphite is injected simultaneously to cover the raw material. Sodium sulphite used is buffer with sodium carbonate or sodium hydroxide to maintain its pH 7-9. The digester is closed carefully. It is revolved at 2.5 R.P.M and a temperature of 160-180ºC. is maintained. The digester takes 45 minutes to attain the desired temperature after which is gets switched off automatically and pressure is released.

43 Pulp formed by digestion is washed at pulp washing stage. Why it is essential? (2 times).

Ans: Pulp is washed thoroughly with water using 80-mesh sieve to remove the black liquor that would contaminate the pulp during subsequent processing steps. The pulp is washed with required amount of water to remove soluble Lignin and coloured compounds Lignin is an aromatic polymer and causes paper to become brittle. It is then thickened and finally stored in high-density storage tower.

44 What are the common bleaching agents used in paper industry in Pakistan? (2 times)

Ans: **Common bleaching agents used in paper industry:-**

In Pakistan, bleaching is done with chlorine dioxide or sodium hypochlorite and hydrogen peroxide.

45 What is meant by Dry cleaning in Paper manufacturing?

Ans: **Dry cleaning in Paper manufacturing:-**

Wheat straw is collected from the storage and is then sent for dry cleaning. For this purpose air is blown into the raw material, which removes unwanted particles.

46 Write down the four major components of paper machine?

Ans: **Major components of paper machine:-**

(i).. Flow Spreader (ii).. Head Box (iii).. Fourdrinjer Table
(iv).. Press Section (v).. Dryer Section (vi)..Calender Stock (vii)..Reel

47. How lignin is removed from paper? (2 times)

Ans: **Removal of lignin from paper:**

The pulp is washed with required amount of water to remove soluble lignin and coloured compounds. Lignin is an aromatic polymer and causes paper to become brittle. It is the then thickened finally stored in high density storage tower.

48. What do you know about screening operation for pulp and paper industry.

Ans: **Screening operation for pulp and paper industry:**

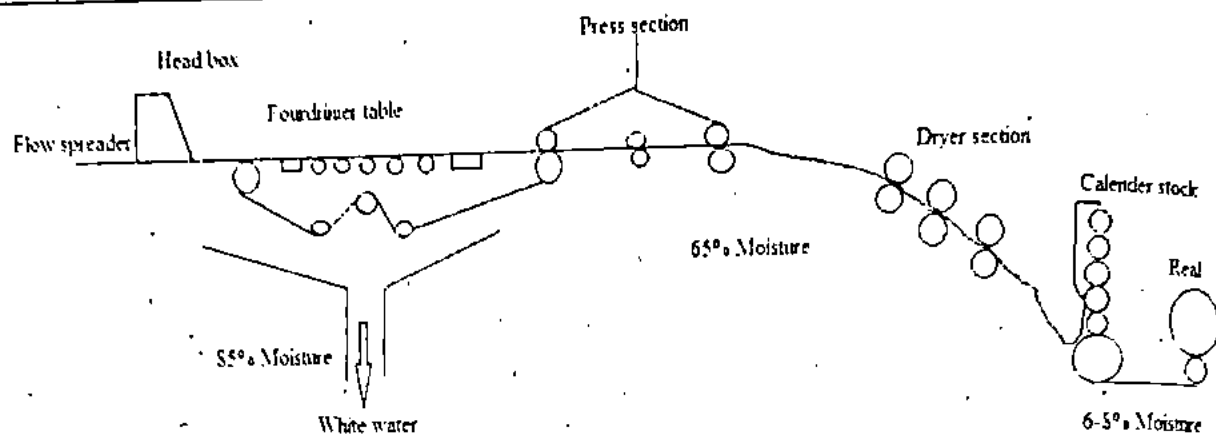
In most pulp and paper processes some type of screening operation is required to remove the over sized troublesome and unwanted particles. Magnetic separator removed iron pieces like nails and bolts, etc. Stones and other oversized pieces are removed by centri-cleaners. The major types of chest screens are vibratory, gravity, and centrifugal. The material is then sent to wet silo.

49. Briefly describe the bleaching process in paper industry. (3 times)

Ans: **Bleaching process in paper industry:**

Bleaching is done with chlorine dioxide or sodium hypochlorite and hydrogen peroxide. After washing, the unbleached pulp is sent to the chlorinator where chlorine at 4-5 bar pressure is injected from chlorine tank. The chlorine react with unbleached pulp at about 45 °C for 45-60 minutes to give the good results. The residual chlorine is neutralized with water which act as antichlor. The correct dosage is important and calculated amount of chlorine is needed to achieve the required brightness. After chlorination pulp is washed with hot water at 60 °C and is then sent to the storage tank. Pulp is dried with hot air supply. After drying, pulp is ready for manufacturing of paper.

50. Draw paper making machine.

Ans: **Diagram of paper making machine:**

2018

51. Define lignin? Write its effect on paper.

Ans: **Lignin:**

Lignin is an aromatic polymer and causes paper to become brittle.

52. How is the wet sheet of paper dried in paper industry.

Ans: **Drying of wet sheet of paper:**

Wet sheet is dried in drying section of machine with the help of rotary drum. Water is separated from fiber either by gravity, by suction or by pressing or by heating.

53. Name principal method for chemical pulping used for production of paper?

Ans: **Chemical Pulping:**

Ans: **Digestion process in paper industry:-**

From wet digestion, the material is sent to digester. The digester is usually 10 meters in length and 2 meters in diameter. It is made of steel and wrought iron. This is the main unit of the process. The digestion process can be either batch or continuous.

As the raw material enters into the digester, steam is introduced at the bottom and a liquor containing sodium sulphite is injected simultaneously to cover the raw material. Sodium sulphite used is buffer with sodium carbonate or sodium hydroxide to maintain its pH 7-9. The digester is closed carefully. It is revolved at 2.5 R.P.M and a temperature of 160-180ºC. is maintained. The digester takes 45 minutes to attain the desired temperature after which is gets switched off automatically and pressure is released.

2019

54. Write raw materials for manufacture of cement.

Ans:
1- Calcarious materials (limestone, marble, chalk etc) as source of CaO
2- Argillaceous materials (clay, shale, slate)
3- Gypsum

55. Write prospects of Fertilizer industry in Pakistan.

Ans: At present there are 14 fertilizer plants in private and public sector in country making different type of fertilizers.

Total product of Urea fertilizer in Pakistan is 5630100 metric tons/anum.

56. What are Phosphatic fertilizers.

Ans: Those fertilizers which provide phosphorous to plants.

e.g; Super phosphate $\left(Ca\left(H_2PO_4\right)_2\right)$, Diammonium phosphate etc.

2021

57. What do you know about Slurry?

Ans: The powdered limestone is then mixed with the clay paste in proper proportion (limestone 75%, clay 25%); the mixture is finely ground and made homogeneous by means of compressed air mixing arrangement. The resulting material is known as slurry. The slurry, which contains 35 to 45% water, is sometimes filtered to reduce the water content from 20 to 30% and the filler cakes are stored in storage bins.

This reduces the fuel consumption for heating stage.

58. Why 2% Gypsum is added into Cement?

Ans: During the grinding there is added about 2% of gypsum which prevents the cement from hardening too rapidly. The addition of gypsum increases the setting time of cement.

CHAPTER NO:16 OBJECTIVES (MCQ'S) ENVIRONMENTAL CHEMISTRY IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 16.1.1

1. Ecosystem is a smaller unit of: (10 times)
(a) Biosphere (b) Lithosphere (c) Atmosphere (d) Hydrosphere
2. Lithosphere is mainly made up of 11 elements , the elements found in highest :
(a) Sodium (b) Calcium (c) Carbon (d) Silicon
3. Thickness of atmosphere is about how much kilometer above the surface of earth:
(a) 1000 KM (b) 10000 KM (c) 100 KM (d) Unlimited

Topic No: 16.2.1

4. Which is secondary pollutant? (2 times)
(a) Carbonic Acid (b) CO_2 (c) SO_2 (d) CO .
5- Which gas is cause of asthma?
(a) O_3 (b)O_2 (c)SO_2 (d) CO_2
6. Which one is the most toxic:
(a) carbon (b) CO (c) CO_2 (d) SO_2

Topic No: 16.2.2

7. Peroxyacetyle nitrate (PAN) is an irritant to human beings and its affects. (8 times)
(a) Eyes (b) Ears (c) Stomach (d) Nose
8. The pH of unpolluted rain water should be: (2 times)
(a)5.00 (b) 5.60 (c) 6.50 (d) 7.00
9. pH range of acid rain is: (7 times)
(a) 7- 6.5 (b) 6.5- 6 (c) 6- 5.6 (d) Less than 5
10. A single chloride free radical can destroy ozone molecules: (2 times)
(a) 100 (b)1000 (c)10000 (d) 100000
11. Chlorofluoro carbons play an effective role in removing $O_3$is the:
(a) Troposphere (b) Stratosphere (c) Polar region (d) Equator

Topic No: 16.2.3

12. The main pollutant of leather tanneries in the waste water is due to the salt of: (9 times)
(a) Lead (b) Chromium (c) Copper (d) Chromium(VI)
13- Fungicides are the pesticides which:
(a) Control the growth of fungus(b) kill insects(c)kill plants (d) kill herbs

Topic No: 16.3.1

14. Which one is better to disinfect water:
(a) Cl_2 (b) O_2 (c) O_3 (d) $KMnO_4$
15. To avoid the formation of toxic compounds with Cl_2, which compound is used for disinfecting water? (6 times)
(a) $KMnO_4$ (b) O_3 (c) Alums (d) Chloramines
16. In purification of potable water the coagulant used is: (5 times)
(a)Nicklesulphate (b) Copper sulphate (c)Bariumsulphate (d)Alum

Topic No: 16.4.2

17. The residual ash after incineration of industrial waste is disposed off in a landfill, which is lined with?
(a) Portland cement (b) Clay and plastic (c) Methyl silicone (d) Stone ware

Topic No: 16.4.3

18. The temperature range in non-rotating chamber in the incineration of industrial and hazardous waste process is:
(a)350 – 1000°C (b) 950 – 1300°C (c) 1500 – 1700°C (d) 500 – 900°C
19. Which one of the following elements is a trace element:
(A) Copper (b) Nitrogen (c)Sulphur (d) Calcium

2018

20. Which one the following binds blood haemoglobin more strongly than oxygen?
(a) CO (b) CO_2 (c) NO_2 (d) SO_2

2019

21. Newspaper can be recycled again and again by how many times?
(a) 4 (b) 5 (c) 2 (d) 3

ANSWERS TO MULTIPLE CHOICE QUESTIONS:

1	2	3	4	5	6	7	8	9	10	11
A	D	A	A	C	B	A	B	D	D	B
12	13	14	15	16	17	18	19	20	21	
D	A	A	B	D	B	B	A	A	B	

CHAPTER NO:16 SHORT QUESTIONS ENVIRONMENTAL CHEMISTRY IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 16.1

1 **Define environmental Chemistry and what are the components of Environment? (7 times)**

Ans: Environmental chemistry deals with the chemicals and other pollutants in the environment. In this we study the sources, reactions, transportation of the chemicals and other toxic substances especially created by human activity in the environment and their adverse effects on human beings.
The environment consists of the following components:
(i). Atmosphere (ii).Hydrosphere(iii).Lithosphere (iv).. Biosphere

Topic No: 16.1.1

2 **What is Biosphere?**

Ans: Biosphere is the region of earth capable of supporting life. It includes lower atmosphere, the oceans, rivers, soils and solid sediments that actively interchange materials with all types of living organisms i.e.human beings, animals and plants.

3 **How the gases in the atmosphere absorb?**

Ans: The gases in the atmosphere absorb most of the cosmic rays and the major portion of the harmful electromagnetic radiation coming from the sun. The absorption of these harmful radiation protects the life on the earth.

4 **What are ecosphere and hydrosphere? (3 times)**

Ans: **Ecosphere:** Biosphere is the region on earth capable of supporting life, it includes lower atmosphere, the oceans, rivers, lakes, soils and solid sediments that actively interchange materials with all types of living organisms i.e. human beings, animals and plants. Ecosphere is a smaller unit of biosphere which consists of community of organisms which lie in a definte zone and depends on the physical factors such as soil, water and air.

Hydrosphere: Hydrosphere includes all water bodies, mainly ocean, rivers, streams, lakes polar ice caps, glaciers and ground water reservoirs (water below earth surface). Oceans contain 97% of earths water but because of high salt contents this water cannot be used for human consumption. The polar ice caps and glaciers consist of 2% of the earth's total water supply. Only 1% of the total earth's water resources are available as fresh water i.e ., surface water; river, lake, stream and ground water. The fresh water is being used by agriculture (69%), industry (23%) and for domestic purposes (8%).

5 **What is lithosphere?** **(2 times)**

Ans: It consist of rigid rocky crust of earth and extends to the depth of 100 km. The mantle and core are the hevy interior of the earth, making up most of the earth's mass. The 99.5% mass of the lithosphere is made of 11 elements, which are oxygen (about 46.6%), Si (27.72%), Al(8.13%), Fe(5.0%), Ca(3.63%), Na(2.83%), K(2.59%), Mg(2.09%) and Ti, H_2 and P (total less than 1%). The elements in trace amount are C, Mn, S, Ba, Cl, Cr, F, Zr, Ni, Sr and V. These elements mostly occur in the form of minerals.

6. **Define Ecosystem.** **(2 times)**

Ans: Ecosystem is a smaller unit of biosphere which cosists of community of organisms & their zone and depend on physical factors such as soil water and air.

Topic No: 16.2.1

7 **What are the secondary pollutants?**

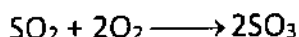
Ans: The primary pollutants in the atmosphere through various reactions produce some pollutants such as sulphuric acid, nitrogen monoxide, carbonic acid, hydrofluoric acid, peroxyacetyl-nitrate (PAN), ozone, aldehydes, ketones and peroxybenzolare called secondary pollutants.

8 **What are main sources of SO_2 as air pollutants?** **(2 times)**

Ans: (a).. **Natural sources:** On global scale of sulphur dioxide is produced by volcanoes (67%) and by oxidation of sulphur containing gases produced by decomposition of organic matter.

(b).. **Human activities:** Air polluted with SO_2 due to combustion of coal, crude oil and other fossil fuel in power plants and petroleum industry etc.

$$S + O_2 \longrightarrow SO_2$$

$$SO_2 + 2O_2 \longrightarrow 2SO_3$$

SO_2 and SO_3 due to their pungent odour are very irritant and suffocating. Through various reactions in the atmosphere they form sulphate aerosol. These aerosols causes severe respiratory troubles particularly among older people. Sulphur dioxide is the major source of acid deposition in the atmosphere.

9 **What are the primary pollutants ?Also give their four names. (3 times)**

Ans: The waste products given out form chimneys of industrial units and exhaust of automobiles may contain gases such as sulphur dioxide, sulphur trioxide, nitrogen oxides, carbon monoxide, hydrocarbons, ammonia, compounds of fluorine and radioactive materials. These waste products are called primary pollutants.

10 **What are primary pollutants and secondary pollutants in atmosphere?(4 times)**

Ans: **Primary pollutants:** The waste products given out form chimneys of industrial units and exhaust of automobiles may contain gases such as sulphur dioxide, sulphur trioxide, nitrogen oxides, carbon monoxide, hydrocarbons, ammonia, compounds of fluorine and radioactive materials. These waste products are called primary pollutants.

Secondary pollutants: The primary pollutants in the atmosphere through various reactions produce some pollutants such as sulphuric acid, nitrogen monoxide, carbonic acid, hydrofluoric acid, peroxyacetyl-nitrate (PAN), ozone, aldehydes, ketones and peroxybenzolare called secondary pollutants.

11. **Why "CO" Carbon monoxide is highly poisonous gas.** **(3 times)**

Ans: Carbon monoxide is highly poisonous gas and causes suffocation if inhaled. It binds blood haemoglobin more strongly than oxygen thus excluding oxygen from normal respiration. The CO poisoning can reversed by giving high pressure oxygen. Exposure to high concentration of CO results in headache, fatigue, unconsciousness and eventually death.

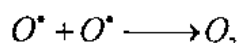
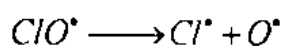
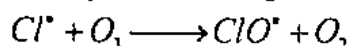
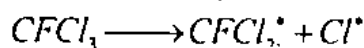
Topic No: 16.2.2

12 **Discuss photochemical smog and give its properties?** **(7 times)**

Ans: Photochemical smog consists of higher concentrations of oxidants like ozone and is also termed as oxidizing smog. It is a yellowish brownish grey haze which is formed in the presence of water droplets and chemical reactions of pollutants in the air. It has unpleasant odour because of its gaseous components.

13 Why ozone layer depleting? (5 times)

Ans: The concentration of ozone in the stratosphere is being depleted through various chemical reactions but the it is seriously affected by chlorofluorcarbons (CFCs). Chlorofuorocarbons used as refrigerants in air conditioning and in aerosol sprays are inert in the troposphere but slowly diffuse into stratosphere, where they are subjected to ultraviolet radiation generating $Cl^{\bullet}$ free radicals which react with ozone and cause ozone depletion.

$$CFCl_3 \longrightarrow CFCl_2^{\bullet} + Cl^{\bullet}$$
$$Cl^{\bullet} + O_3 \longrightarrow ClO^{\bullet} + O_2$$
$$ClO^{\bullet} \longrightarrow Cl^{\bullet} + O^{\bullet}$$
$$O^{\bullet} + O^{\bullet} \longrightarrow O_2$$

14 What is Acid Deposition? How does it affect the building materials?(4 times)

Ans: The rain contains acid is called acid rain, now a days it termed as acid deposition. It produce serious environmental problems. Acid rain is produced due to the presence of CO_2, SO_x and NO_x in atmosphere. CO_2 converts into carbonic acid, while SO_x and NO_x react with oxygen and water and produce H_2SO_4 and HNO_3 respectively. Acid rain damages building materials such as steel, pain, plastic, cement, masonry work and sculptural materials especially of marble and limestone.

15 What are the conditions for the formation of smog? (4 times)

Ans: The following conditions are required for the formation of smog:

(i).. There must be sufficient NO, hydrocarbons and volatile organic compounds (VOC) emitted by the vehicular traffic.

(ii).. Sunlight, so that some of the chemical reactions may occur at a rapid rate.

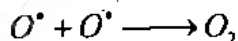
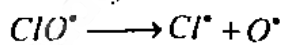
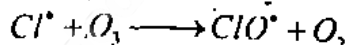
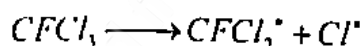
(iii).. The movement of air mass must be little so that reaction are not disturbed.

16 What is the effect of Acid rain on earth(for fishes and human)? (4 times)

Ans: Acidification of the soil and rocks can leach metals like aluminium, mercury, lead and calcium and discharges them into water bodies. These heavy metals are accumulated in the fishes and are health hazards for humans and birds as they eat these fishes. The elevated concentration of aluminuium is harmful for fishes as it clogs the gills thus causing suffocation. Acidification of the soil can also leach nutrients thus damaging leaves and plants and growth of forest. It also damages building materials such as steel, pain, plastic, cement, masonry work and sculptural materials especially of marble and limestone.

17 How ozone layer in stratosphere is affected by chlorofluorocarbons? (4 times)

Ans: Chlorofuorocarbons used as refrigerants in air conditioning and in aerosol sprays are inert in the troposphere but slowly diffuse into stratosphere, where they are subjected to ultraviolet radiation generating $Cl^{\bullet}$ free radicals, which react with ozone and cause ozone depletion.

$$CFCl_3 \longrightarrow CFCl_2^{\bullet} + Cl^{\bullet}$$
$$Cl^{\bullet} + O_3 \longrightarrow ClO^{\bullet} + O_2$$
$$ClO^{\bullet} \longrightarrow Cl^{\bullet} + O^{\bullet}$$
$$O^{\bullet} + O^{\bullet} \longrightarrow O_2$$

18. What do you know about reducing smog and oxidizing somg?

Ans: The smog containing high contents of SO_2 it is chemically reducing in nature and is known as **reducing smog**. The main cause of reducing smog is combustion of coal. Photochemical smog consists of higher concentrations of oxidants like ozone and is also termed as oxidizing smog, it is a yellowish brownish grey haze which is

formed in the presence of water droplets and chemical reactions of pollutants in the air. It has unpleasant odourbecause of its gaseous components.

19 What is acid rain? Give one of its harm to building?

Ans: The rain contains acid is called acid rain, now a days it termed as acid deposition. It produce serious environmental problems. Acid rain is produced due to the presence of CO_2, SO_x and NO_x in atmosphere. CO_2 converts into carbonic acid, while SO_x and NO_x react with oxygen and water and produce H_2SO_4 and HNO_3 respectively. Acid rain damages building materials such as steel, pain, plastic, cement, masonry work and sculptural materials especially of marble and limestone.

Topic No: 16.2.3

20 What are the causes of water pollution?

Ans: Surface and ground water which are vital resources of fresh water are vulnerable to contamination. The human activities such as livestock waste, landfills, agriculture, pesticides, oil leaks and spills, disposal or industrial effluents on open land, water bodies septic tanks, detergents, mining, petroleum and natural gas production may result in the water pollution.

21 How do Leather Tanneries pollute the water? (2 times)

Ans: Many leather tanning units, varying from the cottage scale to big industrial units, are working in and around many big cities of Pakistan. They use large quantities of chromium (VI) salts for leather tanning. They are producing good variety of exportable leather, but only some units have the facility of waste water treatment by reducing Cr (VI) into trivalent state followed by alkaline precipitation of $Cr(OH)_3$. The effluents are discharged onto the open land or put into the sewage system. These industries are the big source of chromium (VI) pollution on the environment. Chromium (VI) is highly toxic and is known to cause cancer.

22 Detergents are threat to aquatic life. Explain. (3 times)

Ans: Detergents are excessively used in industries and household as cleaning agents. The amount of disposed detergents in waste water is increasing day-by-day. This waste water when discharged in rivers or sea, greatly affects the aquatic life. Detergent contents of waste water mobilize the bound toxic ions of heavy metals such as Pb, Cd and Hg from sediments into water.

23 What is smog? What are the contents of photochemical Smog? (2 times)

Ans: The word smog is a combination of smoke and fog. Photochemical smog consists of higher concentrations of oxidants like ozone and is also termed as oxidizing smog, It is a yellowish brownish grey haze which is formed in the presence of water droplets and chemical reactions of pollutants in the air. It has unpleasant odour because of its gaseous components.

The main reactants of photochemical smog are nitric oxide NO and unburnt hydrocarbons. Nitric oxide is oxidized to nitrogen dioxide within minutes to hours depending upon the concentration of pollutant gas.

Topic No: 16.3

24 What is the effect of aeration on quality of raw water?

Ans: The quality of raw water is improve by aeration. In this process air is passed through water to remove the dissolved gases such as foul smelling H_2S, organo-sulphur compounds and volatile organic compounds. Some of the organic materials in the raw water which could be easily oxidized with air produce CO_2 in the aeration process. The remaining portions or organic material if necessary are removed by passing water over activated carbon. Aeration process also oxidizes water soluble Fe^{2+} to Fe^{3+} which then forms insoluble $Fe(OH)_3$ and can be removed as solid. Aeration also improves the oxygen level of raw water.

25 What is chemical oxygen demand (COD).How it is measured?(8 times)

Ans: The organic content of water which consumes oxygen during chemical oxidation is evaluated by its chemical oxygen demand. The oxygen demand of water can

be determined directly by treating it with dichromate ions $Cr_2O_7^{2-}$ which is powerful oxidizing agent. The organic matter in water oxidized, while the remaining dichromate is determined titremetically:

Value of COD is a direct measure of chemically oxidizable matter in water. Higher values of COD will indicate more pollution.

26 How is oil spillage affecting the marine life? (3 times)

Ans: Petroleum or crude oil is a complex mixture of many compounds mainly hydrocarbons. The petroleum products are used as fuel, lubricant, for manufacturing petrochemical, plastics, electrical applications, synthetic rubber and detergents, etc. Sea water gets polluted by accidental oil spills and leakage from cargo oil tankers in sea, tanker trucks, pipelines leakage during off shore exploration and leakage of underground storage tanks. Many petroleum products are poisonous and pose serious health problems to human animals and aquatic life. Hydrocarbons particularly polycyclic aromatics are known to be carcinogenic even at very low concentrations. The marine organisms are severely affected by soluble aromatic fractions of oil (C-10 or less). The spilled oil damages the marine life often causing death.

27 What is biochemical oxygen demand (BOD)? (7 times)

Ans: It is the capacity of organic matter in natural water to consume oxygen within a period of five days. The value of BOD is the amount of oxygen consumed as a result of biological oxidation of dissolved organic matter in a sample. The oxidation reaction is catalyzed by microorganisms which are already present in a natural water. It is measured experimentally by calculating the concentration of oxygen at the beginning and at the end of five days period, in which a sealed water sample is maintained in dark at constant temperature either at 20ºC or 25Cº.

28 Name the factors which affect the quality of water?

Ans: (i).. Dissolved Oxygen (DO). (ii).. Biochemical Oxygen Demand (BOD)
(iii).. Chemical Oxygen Demand (COD)

29. Explain purification of water by use of coagulating agent. (2 times)

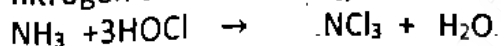
Ans: The coagulant such s aluminium sulphatre or alum is added to the raw water, which causes the precipitation fo suspended impurities. For example, aluminium hydroxide is precipitated when alum is added to water in alkaline medium i.e.,

$$K_2SO_4.Al_2(SO_4)_3.24H_2O + 3Ca(OH)_2 \longrightarrow 3CaSO_4 + 2Al(OH)_3 + K_2SO_4 + 24H_2O$$

Many suspended particles get adsorbed on the surface of gelatinous aluminium hydroxide precipitate. Ferric salts are also commonly used as coagulants but they are difficult to handle because an insoluble ferric oxide is produced in the pH from 3.0 to 13.0

30. Write the harmful effects of Chlorination of Water.

Ans: Harmful effects of chlorination of water are due to its reactions with dissolved ammonia and organic matters present in water. The hypochlorous acid reacts with dissolved ammonia to form chloramines NH_4Cl, $NHCl_2$ and especially nitrogen trichlorideNCl_3, which is a powerful eye irritant.

$$NH_3 + 3HOCl \rightarrow NCl_3 + H_2O$$

Chlorination of water containing organic materials also forms some organic compounds which are toxic. For example it phenol is present in water then chlorinated phenols are formed which have offensive odour and taste and are toxic.

31 What does coagulation mean? (2 times)

Ans: The material which are present or suspended in the colloidal form in raw water are removed by coagulation process. The coagulation such as aluminium sulphate or alum is added to the raw water, which causes the precipitation of suspended impurities. For example aluminium hydroxide is precipitated when alum is added to water in alkaline medium.

Topic No: 16.4

32. What is Landfill?

Ans: The municipal solid waste is mainly disposed off by dumping it in a landfill. The landfill is a large hole in the ground or even a bare piece of land when the landfill becomes full with water it is coveredby soil or clay. The side land is selected on a number of factors such as topography.

33 Discuss detergents as water pollutants? (3 times)

Ans: Detergents are excessively used in industries and household as cleaning agents. The amount of disposed detergents in waste water is increasing day-by-day. This waste water when discharged in rivers or sea, greatly affects the aquatic life. Detergent contents of waste water mobilize the bound toxic ions of heavy metals such as Pb, Cd and Hg from sediments into water.

34 How detergents are treat to aquatic animal

Ans: Detergents are excessively used in industries and household as cleaning agent. The amount of disposed detergent in waste water is increasing day by day. This waste water when discharge in river or sea, greatly effects the aquatic life. Detergent content of waste water mobilize the boud toxic ions of heavy metals such as Pb, Cd and Hg from sediments into water.

35 What are the effects of dumping waste in sea and rivers.

Ans: Water covers more than70% of the earth and is valuable source for food and minerals. Sea and rivers have long been used for dumping waste of industries and municipal discharges such as acids, refinery wastes, pesticides waste, construction and demolition debris, explosives, domestic refuse, garbage and radioactive waste, etc. The dumping of waste materials in water has damage the marine environment and caused health hazards to human beings.

36 What is recycling of raw materials?

Ans: In recycling some of the used or waste materials are not discarded after their initial use but are processed so that they can be used again. The purpose of recycling is to conserve sources such as raw material and energy.

2018

37. What is leachate?

Ans: Leachate: The ground water which seeps in the landfill and liquid form the waste itself all percholate through the refuse producing leachate. The leachate contains dissolved, suspended and microbial contaminants.

38. What are sulphate aerosols? How do they effect the older people?

Ans: SO_2, SO_3 because of their pungent odour are very irritant and suffocating. Through various reactions in the atmosphere they form sulphate aerosols. These aerosols cause sever respiratory troubles particularly among older people. Sulphur dioxide is the major source of acid deposition in the atmosphere.

2019

39. Explain the process of Incineration of Industrial waste.

Ans: In this process, solid waste is burnt at high temperature from 900 to 1000°C. The burning of solid waste in the incinerator consumes all combustible materials leaving behing non-combustible materials and ash residues.

40. What is dissolved oxygen.

Ans: It is most important oxidizing agent in water which is molecular oxygen. Its concentration ranges from 4 – 8 ppm.
The DO value less than 4ppm means water is polluted.

41. How temperature varies in the stratosphere and tropo-sphere with change of altitude.

Ans: Moving up in atmosphere lowers temperature upto – 60°C while moving up in strato – sphere increases temperature due to presence of ozone gas.

CHAPTER NO:16 LONG QUESTIONS IN ALL PUNJAB BOARD PAPERS- 2011-2021

Topic No: 16.1

1 Name components of environment . Give approximate composition of atmosphere and lithosphere. (3 times)

Ans: (Text Book Page No:306)

Topic No: 16.2.1

2 Describe natural and human activities that cause pollution due to the following: i) Carbon monoxide ii) Hydrocarbons

Ans: (Text Book Page No:308)

3 What is smog? Explain the pollutants which are the main causes of photo chemical smog. (2 times)

Ans: (Text Book Page No:310)

4 What is Smog? Give conditions for the formation of a smog. (4 times)

Topic No: 16.2.2

5 What is acidic rain? How does it affect our environment? (4 times)

Ans: (Text Book Page No:310)

6 Write a note on smog. (2 times)

Ans: (Text Book Page No:310)

7 Why is ozone layer depleting? What will happen when the concentraion of ozone will be decreased. (2 times)

Ans: (Text Book Page No:311)

8 Describe the role of Chloroflurocarbons in destroying Ozone.

Ans: (Text Book Page No:)

9 What is meant by acid rain? How is it formed? Give its effects. (2 times)

Ans: (Text Book Page No:310)

Topic No: 16.2.3

10 How can water be purified?

Ans: (Text Book Page No:315)

11 How pesticides are dangerous to human being?

Ans: (Text Book Page No:)

12 What are pesticides? Explain how pesticides are dangerous to human being.

Ans: (Text Book Page No:)

13 Write a note on oil spillage.

Ans: (Text Book Page No:312)

14 Explain how pesticides are dangerous to human being.

Ans: (Text Book Page No:312)

15 What do you know about water pollution? How is water polluted by industrial effluents?

Ans: (Text Book Page No:312+313) (2 times)

16 What are the main sources from which Surface and Ground water is polluted (Write only four)

Ans: (Text Book Page No:308)

Topic No: 16.3.1

17 How water is purified i.e.made potable by aeration and coagulation?(3 times)

Ans: (Text Book Page No:)

Topic No: 16.4.5

18 Explain the process of incineration of industrial waste. (3 times)

Ans: (Text Book Page No317:)

2018

19. Describe the hydrosphere and lithosphere of environment?

Ans: (Text Book Page No:307)

20. Write note on (i) Hydrosphere (ii) Biosphere

Ans: (Text Book Page No:307)

Board Papers 2019

SAHIWAL BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2019) **Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Reaction between Fat and NaOH is called as:**
(a) esterificitaon (b) hydrogenolysis (c) fermentation (d) saponification

2. **Coagulant used for purification of potable water is:**
(a) $NiSO_4$ (b) $BaSO_4$ (c) $CuSO_4$ (d) Alum

3. **Which one is not a calcarious material?**
(a) lime (b) clay (c) marble (d) marine shell

4. **Hydrolysis of Fats occur by enzyme.**
(a) Urease (b) maltase (c) Zymase (d) Lipase

5. **Acetamide is prepared by:**
(a) heating of CH_3COONH_4 (b) heating of CH_3CN
(c) heating of $CH_3COOC_2H_5$ (d) hydrolysis of CH_3CN

6. **Which one has the highest boiling point?**
(a) Methanal (b) propanal (c) EhanOl (d) 2-Hexanone

7. **Methyl alcohol is not used as:**
(a) solvent (b) antifreezing agent
(c) substitute of petrol (d) denaturation of alcohol

8. **The most reactive compound is:**
(a) Benzene (b) Ethene (c) Ethane (d) Ethyne

9. **Which one is not a nucleophile?**
(a) H_2O (b) H_2S (c) BF_3 (d) NH_3

10. **Conversion of unsaturated hydro carbons to saturated hydrocarbons in the presence of catalyst is called as:**
(a) halogenation (b) hydrogenation (c) hydroxylation (d) dehydrogenation

11. **Both CH_3COOH and $HCOOCH_3$ show isomerism:**
(a) position (b) chain (c) geometric (d) functional group

12. **Formula of Haematite is:**
(a) FeS_2 (b) Fe_2O_3 (c) $FeCO_3$ (d) Fe_3O_4

13. **Weakest acidic solution wil be of:**
(a) HF (b) HBr (c) HI (d) HCl

14. **Catalyst used in contact process is:**
(a) NO/NO_2 (b) Fe_2O_3 (c) SO_3 (d) V_2O_5

15. **Chief ore of aluminium is:**
(a) Na_3AlF_6 (b) $Al_2O_3 2H_2O$ (c) Al_2O_3 (d) $Al_2O_3.H_2O$

16. **Compound obtained when Na burns in excess of air**
(a) NaO_2 (b) Na_2O_2 (c) Na_2O (d) Na_2O_3

17. **Mark the correct statement:**
(a) Na^+ is smaller than Na -atom (b) Na^+ is larger than Na-atom
(c) Cl^- is smaller than Cl^- atom (d) Cl^- and Cl -atom are equal in size

SAHIWAL Board

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Lanthanide contraction controls the size of elements of 6th and 7th periods. Explain the statement.
ii. Give reason for order of hydration enérgies $Al^{3+} > Mg^{2+} > Na^{+}$.
iii. How lime mortar is prepared from lime? Explain chemical equations.
iv. What is chemical garden?
v. How does weathering of potassium feldspar occur? Explain with the help of chemical equation.
vi. Give chemical formula of soaptone and its two uses.
vii. Complete and balance the given chemical equations.
(a) $H_2S + NO \rightarrow$ (b) $HNO_3 + HN_3 \rightarrow$
viii. Give two examples to prove NO_2 as a strong oxidizing agent.
ix. How is orthophosphoric acid converted to metaphosphoric acid? Give complete chemical reaction.
x. Name various steps involved in the manufacturing of Portland cement by wet process.
xi. Write four essential qualities of a good fertilizer.
xii. Describe role of chlorofluorocarbons (CFCs) in removing ozone in stratosphere by mean of chemical reactions.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why is there no free rotation about a double bond but a free rotation about a single bond?
ii. What is mustard gas? How it is produced?
iii. Write structural formulas of the following compounds.
(i) 3-methyl -1-pentene -4-yne (ii) But -1-en-3-yne
iv. Describe X-ray structure of Benzene.
v. What are mono cyclic aromatic hydrocarbons? Give two examples.
vi. What is a Nucleophilic substitution reaction? Give example.
vii. Why $SOCl_2$ is the best reagent to get alkyl halides from alcohols? Explain with reaction.
viii. Define fermentation. Write essential conditions for fermentation.
ix. Write structural formulas of the given compounds: (a) Tartaric acid (b) Lactic acid
x. What is Ninhydrin test? Give its use.
xi. What are essential and non essential amino acids?
xii. What is a peptide bond? Write formula of a dipeptide.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. Why iodine has metallic luster? ii. What are Freon's and Teflon's?
iii. The bleaching action of bleaching powder is due to its oxidative character, justify it.
iv. Damaged tin plated iron gets rusted quickly, give reason.
v. Write chemistry of silver mirror test.
vi. Write reaction for the conversion of methanol to ethanol.
vii. Make difference between fat and oil.
viii. Write importance of DNA. ix. What is iodine number.

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. **(a)** Write any two similarities and two differences between hydrogen and halogens.
(b) Describe with diagram the manufacture of sodium by Down's cell.
6. **(a)** Give any two methods for the preparation of potassium chromate?
(b) Explain the process of incineration of industrial waste.
7. **(a)** What are homocyclic and heterocyclic compounds? Give suitable examples in each case.
(b) Discuss how X-Rays studies confirmed hexagonal structure for benzene. Also discuss objections to Kekule's structure.
8. **(a)** Write a note on halogenations of alkanes by explaining all the steps involved.
(b) Explain following properties with reference to phenol.
(i) Eserification (ii) Sulphonation
9. **(a)** What products are formed when the following compounds are treated with ethylmagnesium bromide, followed by hydrolysis in the presence of acid?
(i) CH_3CHO (ii) CO_2 (iii) $(CH_3)CO$ (iv) $ClCN$
(b) Explain the mechanism of the reaction of phenylhydrazine with acetone.

D.G KHAN BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time : 20

Session (2019) **Objective** Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Alkali metals are:**
(a) Acidic in nature (b) Amphoteric nature
(c) Strong oxidizing agent (d) Strong reducing agents

2. **Element Cs (Cesium) shows resemblance with:**
(a) Ca (b) Cr (c) both a, b (d) Fr

3. **Which element form an ion with charge +3**
(a) Be (b) Al (c) C (d) Si

4. **Maximum electronegative character is present in**
(a) Sb (b) N (c) P (d) Si

5. **Maximum number of unpaired electrons are in cation:**
(a) Ni^{2+} (b) CO^{2+} (c) Mn^{2+} (d) Fe^{2+}

6. **The strongest acid is:**
(a) HClO (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

7. **Ether show the phenomenon of Isomerism:**
(a) Position (b) Functional group (c) Metamerism (d) Cis-Trans

8. **Synthetic rubber is made by polymerization of:**
(a) Chloroform (b) Acetylene (c) Divinyl-acetylene (d) Chloroprene

9. **Sooty flame on burning aromatic-compound is dud to:**
(a) High percentage of hydrogen (b) Ring structure
(c) High percentage of carbon (d) Resistant reaction with air

10. **Reactivity of Grignard's reagent is due to:**
(a) Halogen atom (b) Mg-atom (c) Polarity of C-Mg bond (d) All of these

11. **Cannizzaro's reaction is not given by:**
(a) HCHO (b) $O-\overset{\overset{O}{||}}{C}-H$ (c) $CH_3-\overset{\overset{O}{||}}{C}-H$ (d) $(CH_3)_3-\overset{\overset{O}{||}}{C}-H$

12. **Which one is not a fatty acid:**
(a) Propionic Acid (b) Acetic Acid (c) Phthalic Acid (d) Butanoic Acid

13. **Which one element is not present in all proteins?**
(a) Carbon (b) Hydrogen (c) Nitrogen (d) Sulphur

14. **Phosphorous helps in growth of:**
(a) Root (b) Leaf (c) Seed (d) Stem

15. **The pH range for acid rain is ____________:**
(a) 7 to 6.5 (b) 6.5 to 6 (c) 6 to 5.5 (d) less than 5

16. **The fiber made up from Acrylonitril as monomer is:**
(a) PVC (b) Ryon fiber (c) Acrylic fiber (d) Polyester fiber

17. **Which compound is called as universal solvent:**
(a) H_2O (b) CH_3OH (c) C_2H_5OH (d) CH_3-O-CH_3

D.G KHAN Board

Chemistry (New Scheme) **(Inter Part-II Class 12[th])** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why oxidation state of noble gaes is usually zeo?
ii. ZnO is of Amphoteric nature. Justify it.
iii. What is the chemical nature of lime water and milk of magnesia?
iv. Write down chemical formulae of minerals (i) Emerald (ii) Gibbsite
v. Write the names and the formulas of four boric acids.
vi. Write down the four properties of vitreous silica.
vii. How NO reacts with H_2S and H_2SO_3?
viii. Write two methods of preparation of nitrous acid.
ix. Write down two reactions in which P_2O_5 is acting as a dehydrating agent.
x. Write a chemical reaction for conversion of oil into a fat.
xi. Write down two properties of enzymes.
xii. How the temperature varies in the stratosphere and troposphere with change of altitude?

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why is there no free rotation around a double bond?
ii. How is a cis-alkene prepared from an alkyne?
iii. What is Markownikov's Rule? Give an example.
iv. Draw the structures of Phenanthrene and Anthracene.
v. Give general mechanism of electrophilic substitution reactions of benzene.
vi. Write reactions of ethyl magnesium bromide with (a) Ammonia (b) Water.
vii. What do you understand by the term $\beta-$ elimination reactions?
viii. Why are alcohols, phenols and ethers considered as derivatives of water?
ix. Give classification of monohydric alcohols with examples.
x. Write structures of (a) oxalic acid (b) Malonic acid.
xi. How are carboxylic acids prepared from alkyl nitriles?
xii. What is meant by essential and non essential amino acids?

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What are Freons and Teflon?
ii. Give reactions of Bleaching powder with following reagents
(a) dil. $dil.H_2SO_4$ (ii) NH_3
iii. How is Radon formed from Radium? Explain by help of equation.
iv. Give systematic names of following (a) $\left[Pt(OH)_2(NH_3)\right]SO_4$ (b) $\left[Fe(H_2O)_6\right]^{2+}$
v. Explain chemistry of Tallen's test.
vi. Describe mechanism of Aldal condensation.
vii. What are repeating units in the following polymers? (a) Polystyrene (b) Teflon
viii. Differentiate between a glycoside linkage and a peptide linkage.
ix. What are Lipids?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Write any two similarities and two differences between hydrogen and alkali metals.
(b) Describe the manufacture of sodium hydroxide by diaphragm cell, diagram is not required.

6. (a) Explain the following properties for transition elements.
(i) Paramagnetism (ii) Colour.
(b) Define smog. Give its types and write conditions for the formation of smog.

7. (a) Define hybridization of orbitals. Explain the structure of methane with SP^3 hybridization.
(b) Explain the sulphonation of benzene with mechanism.

8. (a) Write reactions of Phenol with
(i) $di.HNO_3$ (ii) $H_2SO_4(conc)$ (iii) Br_2 (iv) CH_3COCl
(b) How ethyne reacts with:
(i) Alkaline. $KMnO_4$ (ii) 10% H_2SO_4 in the presence of $HgSO_4$
(iii) HBr (iv) NH_3 / Al_2O_3

9. (a) What products are formed when the following compounds are treated with ethyl magnesium bromide, followed by hydrolysis in the presence of an acid?
(i) HCHO (ii) CH_3CHO (iii) CO_2 (iv) $(CH_3)_2CO$
(b) How will you distinguish between
(i) Methanal and Ethanal (ii) Ethanal and Propanone

BAHAWALPUR BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time : 20
Session (2019) **Objective** Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Mark the correct statement:**
(a) Na^+ is smaller than Na atom (b) Na^+ is larger than Na atom.
(c) Cl^- is smaller than Cl atom (d) Cl^- (ion) and Cl (atom) are equal insize

2. **Laughing Gas is chemically:**
(a) NO (b) N_2O (c) N_2O (d) N_2O_4

3. **Which metal is used in the Thermite Process because of its reactivity:**
(a) Iron (b) Copper (c) Aluminium (d) Zinc

4. **Which one of the following does not belong to Alkaline earth metals:**
(a) Be (b) Ra (c) Ba (d) Rn

5. **Which one of the given is the strongest Acid:**
(a) HClO (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

6. **Syntheitc Rubber is made by Polymerization of:**
(a) Chloroform (b) Acetylene (c) Divinyl Acetylene (d) Chloroprene

7. **The state of Hybridization of Carbon in Methane is:**
(a) Sp^3 (b) Sp^2 (c) Sp (d) dsp^2

8. **Coordination Number of Pt in $[PtCl(NO_2)(NH_3)_4]SO_4$ is:**
(a) 2 (b) 4 (c) 1 (d) 6

9. **During Nitration of Benzene, the active Nitrating agent is:**
(a) NO_3 (b) NO_2^+ (c) NO_2^- (d) HNO_3

10. **The Carbon of Carbonyl Group is:**
(a) Sp Hybridized (b) Sp^2 Hybridized (c) Sp^3 Hybridized (d) dSp^2 Hybridized

11. **Which Compound is called a Universal Solvent:**
(a) H_2O (b) CH_3OH (c) C_2H_5OH (d) CH_3-O-CH_3

12. **In Primary Alkyl Halides, the Halogen Atom is attached to a Carbon which is further attached to:**
(a) Two Carbon Atoms (b) Three Carbon Atoms
(c) One Carbon Atom (d) Four Carbon Atoms

13. **Which Reagent is used to reduce a Carboxylic Group to an Alcohol:**
(a) H_2/Ni (b) H_2/Pt (c) $NaBH_4$ (d) $LiAlH_4$

14. **Ammonium Nitrate fertilizer is not used for which crop:**
(a) Cotton (b) Wheat (c) Sugar (d) Paddy Rice

15. **Which one of the following elements is present in all the proteins:**
(a) Cl (b) Cu (c) N (d) Al

16. **Which of these Polymers is aSynthetic Polymer:**
(a) Animal Fat (b) Starch (c) Cellulose (d) Polyester

17. **The main pollutant of Leather Tanneries in waste water is the salt of:**
(a) Lead (b) Chromium (c) Copper (d) Chromium (III)

BAHAWALPUR BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. The Oxidation States vary in a Period but remain almost constant in a group. Give reason.
ii. Ionic Character of Halides decrease from left to the right in a period. Give reason.
iii. What happened when:
(i) Lithium Carbonate is Heated (ii) Lithium Hydroxide is heated to red.
iv. CO_2 is non-polar in nature. Explain.
v. Write formula of White Lead and write its one use.
vi. How and under what conditions does Aluminium react with Oxygen and Hydrogen?
vii. SO_3 is dissolved in H_2SO_4 and not in hot water. Give reson.
viii. How does Nitrogen is different from other elemetns of its group?
ix. Give the advantage of Contact Process for the manufacture of H_2SO_4.
x. Define Cement. xi. What is Prilling in Urea manufacturing?
xii. Oil Spillage affects the marine life. Justify.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Describe the importance of Wohler's Work in the development of Organic Chemistry.
ii. Write down structural formula of product formed when 1-butene reacts with Br_2 in CCl_4.
iii. Identify A,B and C in the following reaction:
$$Propene \xrightarrow{Br_2} A \xrightarrow[KOH]{Alcoholic} B \xrightarrow{HCN} C$$
iv. Give Products and necessary conditions for the following reactions:
(a) Phenol with Zn (ii) Benzene with SO_3
v. How will you prepare $P-$Nitrochloro Benzne from Benzene?
vi. Give four characteristic of S_{N2} reactions in Alkyl Halides.
vii. Give reactions and conditions to convert Ethyl Bromide into:
(a) ethyl Alcohol (b) Ethyl Cynide
viii. What do you mean by Denaturing of Alcohol?
ix. How will you distinguish between an Alcohol and a Phenol by a chemical reaction?
x. Give the reactions of Acetic Acid with: (a) NaOH (b) $SoCl_2$
xi. Write the structural formulae of : (a) Oxalic Acid (b) Malonic Acid
xii. Describe mechanism of reaction of Acetic Acid with Ammonia.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is Iodized Salt? ii. Why has Iodine Metallic Luster?
iii. What are Disproportionation Reaction? Explain your answer with an example.
iv. Give systematic names to the given compounds:
(a) $K_2[Cu(CN)_4]$ (b) $[Fe(CO)_5]$
v. Give four uses of Formaldehyde.
vi. How will you distinguish between Ethanal and Propanone?
vii. What are Derived Proteins? Give example.
viii. What is the basic difference between Starch and Cellulose?
ix. What are characters of Lipid?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) What are Oxides? Describe various types of Oxides.
(b) How Sodium (Na) is prepared by Down's Cell Process?

6. (a) How is Potassium Dichromate prepared? Give its reaction with: (a) $FeSO_4$ (b) KI
(b) What is Smog? Explain the pollutants which are main cause of smog.

7. (a) Define Sp^2 Hybridization and on its basis explain the structure of Ethene.
(b) How can you convet Benzene into:
(a) Cyclohexane (b) Maleic Anhydride (c) Glyoxal (d) Acetophenone

8. (a) How is Ethanol prepared from Molasses and Starch by Fermentation?
(b) Write down structural formula of the products formed when:
1-Butene reacts with:
(a) Cold dil $KMnO_4 / OH^-$ (b) HBr. (c) O_2 in the presence of Ag_2O (d) $HOCl$

9. (a) Explain Mechanism of S_{N1} reactions with a suitable example.
(b) For detection of Aldehydes, write down any two tests and also give their reactions.

MULTAN BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time : 20
Session (2019) **Objective** Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Among group VA elements, the most electronegative element is:**
(a) Sb (b) N (c) P (d) As
2. **The strongest acid is:**
(a) $HClO$ (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$
3. **Coordination Number of Pt in $\left[PtCl(NO_2)(NH_3)_4\right]$ is:**
(a) 2 (b) 4 (c) 1 (d) 6
4. **Select from the following the one which is alcohol.**
(a) CH_3-CH_2-OH (b) CH_3-O-CH_3
(c) CH_3COOH (d) CH_3-CH_2-Br
5. **Which one of the following gases is used for artificial ripening of fruits?**
(a) Ethene (b) Ethyne (c) Methane (d) Propane
6. **Aromatic hydrocarbons are the derivatives of:**
(a) Normal series of paraffins (b) Alkene
(c) Benzene (d) Cyclohexane
7. **When CO_2 is made to react with ethyl magnesium iodide, followed by acid hydrolysis, he product formed is:**
(a) Propane (b) Propanoic acid (c) Propanal (d) Propanol
8. **According to Lewis concept ethers behave as:**
(a) Acid (b) Base (c) Catalyst (d) Enzyme
9. **Which of the following will have the highest boiling point?**
(a) Methanal (b) Ethanal (c) Propanal (d) 2-Hexanone
10. **Which of the following is used in the manufacture of synthetic fibre?**
(a) Formic acid (b) Oxalic acid (c) Carbonic acid (d) Acetic acid
11. **Which one of the following statements about glucose and sucrose is incorrect?**
(a) Both are soluble in water (b) Both are naturally occurring
(c) Both are Carbohydrates (d) Both are disaccharides
12. **In which of these processes are small organic molecules made into macromolecules?**
(a) The cracking of petroleum fractions (b) The fractional distillation of crude oil
(c) The polymerization of ethane (d) The hydrolysis of proteins
13. **Micronutrients are required in quantity ranging from:**
(a) 4-40 g (b) 6-200 g (c) 6-200 kg (d) 4-40 kg
14. **Ecosystem is the smaller unit of:**
(a) Lithosphere (b) Hydrosphere (c) Atmosphere (d) Biosphere
15. **Which statements is incorrect?**
(a) All the metals are good conductors of electricity
(b) All the metals are good conductor of heat
(c) All the metals form positive ions (d) All the metals form acidic oxides.
16. **Which of the following Sulphates is not soluble in water?**
(a) Sodium Sulphate (b) Potassium Sulphate (c) Zinc Sulphate (d) Barium Sulphate
17. **Chemical composition of Colemanite is:**
(a) $Ca_2B_6O_{11}.5H_2O$ (b) $CaB_4O_7.4H_2O$ (c) $Na_2B_4O_7.4H_2O$ (d) $CaNaB_5O_9.8H_2O$

MULTAN BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why does ionic character of halides decrease from left to right in a period?
ii. How does Lanthanide contraction control the atomic sizes of elements of 6th and 7th periods?
iii. Why is Potassium Superoxide used in breathing equipments of mountaineers and in space craft?
iv. How is boric acid prepared from colemanite?
v. What is effect of heat on boric acid?
vi. What is Asbestos? Give its two uses.
vii. Give the reactions of nitric acid with: (a) Arsenic (b) Antimony
viii. What is aqua regia? How does it dissolve gold?
ix. What happens when following compounds are heated with conc. H_2SO_4?
(a) $C_6H_{12}O_6$ (b) H_5C_2OH
x. What are macro-nutrients? Give their names.
xi. Give four properties of a good fertilizer.
xii. State the term "Dissolved Oxygen (D.O)". What is it's use?

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Define the term Carbonization. Indicate three fractions obtained by the carbonization of coal.
ii. Write structural formulas of the following:
(i) 3-n-Propyl-1, 4-Pentadiene (ii) Divinyl acetylene
iii. Define heat of combustion with example.
iv. How will you prepare m-chloronitrobenzene from benzene in two steps?
v. Write two objections that were raised on Kekule's structure for benzene molecule.
vi. Write reaction of ethyl magnesium chloride with water.
vii. Write an excellent method for the preparation of simple alkyl iodides.
viii. Write structural formulas of these compounds: (i) Ethoxy propane (ii) Lactic acid
ix. How ethanol is denatured to avoid its use for drinking purpose?
x. Write the structural formulas of these compounds:
(i) Phthalic acid (ii) Acetic anhydride
xi. What is zwittre ion? How it is formed?
xii. What are essential and non-essential amino acids?

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What are disproportionation reactions? Explain your answer with suitable example.
ii. HF is weaker acid than HCl. Why?
iii. Arrange these ions in order of increasing size. F^-, I^-, Cl^-, Br^-.
iv. Why does damaged tin plated iron get rusted quickly?
v. Describe general mechanism of base-catalyzed addition reaction of carboxyl compounds.
vi. How will you distinguish between ethanol and propanone?
vii. Draw cyclic structure of glucose and fructose.
viii. Define acid number. What is rancidity? ix. What is meant by hardening of oil?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) What are hydrides? Write down their classification and the properties of the covalent hydrides.
(b) Describe the preparation of NaOH by Nelson's cell.
6. (a) How will you manufacture wrought iron from cast iron?
(b) What is smog? Explain the pollutants which are main cause of photochemical smog.
7. (a) Define hybridization and explain the structure of Ethyne on the basis of hybridization.
(b) What are Friedel-Crafts alkylation? Explain by giving two examples with mechanism.
8. (a) Write down structural formulae for the following compounds:
(i) Isobutylene (ii) But-1-one-3-Yne (iii) 2,5-Heptadiene (iv) Vinyl bromide
(b) Explain following terms using ethyl alcohol as an example:
(i) Esterification (ii) Ether formation (iii) Oxidation (iv) Dehydration
9. (a) What are Grignard reagents? How can you prepare a primary, secondary and a tertiary alcohol with the help of Grignard reagent?
(b) Write reaction equation for reaction of ethanal with:
(i) NH_2OH (ii) NH_2-NH_2 (iii) $H_2N-NHC_6H_5$ (iv) $2,4-DNPH$

GUJRANWALA BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th)

Session (2019) **Objective** Time : 20

Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Formula of chloroform is:**
(a) CCl_4 (b) $CHCl_3$ (c) CH_2Cl_2 (d) CH_3Cl

2. **The chemist who synthesized urea from ammonium cyanate was:**
(a) Berzelius (b) Kolbe (c) Wohler (d) Lavoisier

3. **Which of these polymers is a synthetic polymer?**
(a) animal fat (b) starch (c) cellulose (d) polyester

4. **Co-ordination number of Pt in $[Pt(Cl)(NO_2)(NH_3)_4]^{2+}$ is:**
(a) 1 (b) 2 (c) 4 (d) 6

5. **All of following are included in calcarious materials except:**
(a) lime (b) clay (c) marble (d) marine shell

6. **The solution of which acid is used for seasoning of food?**
(a) formic acid (b) acetic acid (c) benzoic acid (d) butanoic acid

7. **Oxidation of NO in air produces:**
(a) N_2O (b) N_2O_3 (c) N_2O_4 (d) N_2O_5

8. **Rectified spirit contains about how many percent of alcohol?**
(a) 80% (b) 85% (c) 90% (d) 95%

9. **The reaction between fat and NaOH is called:**
(a) esterification (b) hydrogenolysis (c) fermentation (d) saponification

10. **Which of following element is not abundantly present in earth's crust?**
(a) silicon (b) aluminum (c) sodium (d) oxygen

11. **Non-metals are present in which block of periodic table?**
(a) s-block (b) p-block (c) d-block (d) f-block

12. **Which halogen occurs naturally in a positive oxidation state?**
(a) fluorine (b) Chlorine (c) bromine (d) iodine

13. **For which mechanisms, the first step involved is the same?**
(a) E_1 and E_2 (b) E_2 and SN_2 (c) SN_1 and E_2 (d) E_1 and SN_1

14. **Which of the following will have the highest boiling point?**
(a) mathanal (b) ethanal (c) propanal (d) 2-hexanone

15. **Aromatic hydrocarbons are the derivatives of:**
(a) alkanes (b) alkenes (c) benzene (d) cyclohexane

16. **The pH range of the acid rain is:**
(a) 7-6.5 (b) 6.5-6 (c) 6-5.6 (d) less than 5

17. **Which hydroxide gets decomposed on heating?**
(a) $LiOH$ (b) NaOH (c) KOH (d) RbOH

GUJRANWALA BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why the values of the ionization energy decreases down the group?
ii. Why ZnO is regarded as amphoteric oxide?
iii. Why lime water turns milky with CO_2 but becomes clear with excess of CO_2?
iv. How boric acid is prepared on commercial scale from Colemanite?
v. Why Aluminium sheets are said to be corrosion free?
vi. Why CO_2 is a gas at room temperature while SiO_2 is a solid?
vii. How an aqua regia dissolves gold?
viii. How orthophosphoric acid is converted into pyro and metaphosphoric acid?
ix. How hot concentrated H_2SO_4 reacts with Cu and Ag metals?
x. Name four macronutrients and also mention per acre range of their requirement.
xi. Name any four parts of paper making machine.
xii. What is "Chemical Oxygen Demand (COD)"? How is it measured?

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. What is "Catalytic Cracking"?
ii. Compounds containing double bonds are more reactive, give reason.
iii. Write mechanism for the addition of halogen in alkene.
iv. Prepare benzene from acetylene dn n-hexane.
v. Draw structural formulas of p-nitrotoluene and p-Dibenzylbenzene.
vi. Starting from suitable Grignard reagent prepare ethane and ethyl cyanide.
vii. Write reaction to prepare tetra ethyl lead dn Nitro ethane.
viii. Prepare ethanol from starch.
ix. Convert ethanol to Iodoform.
x. Write strecker synthesis to prepare amino acid.
xi. What is glacial acetic acid.
xii. Write structural formula of Lysine and Valine.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is an "Iodized Salt"?.
ii. Why iodine has metallic luster? Justify.
iii. Name any two methods to manufacture bleaching powder. Also give reaction for this.
iv. Name different forms of Iron and mention which is the purest form?
v. Describe Tollen's test for the identification of aldehydes.
vi. Write any four uses of formaldehyde.
vii. Define saponification number with a suitable example.
viii. Write two points of difference between a fat and oil.
ix. Differentiate with at least two points between "Amylose" and "Amylopectin".

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Explain "Hydration Energy" as periodic property.
(b) Point out the eight differences between Li and its group members.

6. (a) What is meant by "Corrosion? Explain electrochemical theory of corrosion.
(b) What is "Acid Rain"? Give detailed effects of acid rain on environment.

7. (a) Write down any four important features of organic compounds.
(b) Draw structural formulas of following compounds:
(i) m-chlorobenzoic acid (ii) 2,4,6 trinitrotoluene
(iii) p-hydroxybenzoic acid (iv) m-nitrophenol

8. (a) How is ethyne converted into following compounds?
(i) Acetaldehyde (ii) Chloroprene (iii) Acrylonitrile (iv) Methyl nitrile
(b) Name the following compounds according to I.U.P.A.C system:
(i) $H_3C-C_2H-C_2H-O-C_3H$ (ii) $H_3C-O-C_6H_5$
(iii) $H_5C_2-CH(CH_3)-OH$ (iv) $(H_3C)_3COH$

9. (a) Discuss "Aldol Condensatin" with mechanism.
(b) Using ethyl bromide as a starting material, how will you prepare the following compounds:
(i) n-Butane (ii) ethyl alcohol (iii) propanoic acid (iv) ethane

LAHORE BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th)
Session (2019) Objective
Time : 20
Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Elimination bimolecular reactions involve:**
(a) Zero order reactiosn (b) First order reactions
(c) Second order reactions (d) Third order reactions

2. **The percentage of carbon in different type of iron products is in the order of:**
(a) Cast iron> wrought iron> steel (b) Wrought iron>steel > cast iron
(c) Cast iron> steel> wrought iron (d) Cast iron = steel> wrought iron

3. **Which acid is used in the manufacture of synthetic fibre:**
(a) Formic acid (b) Acetic acid (c) Oxalic acid (d) Carbonic acid

4. **Chile saltpeter has the chemical formula:**
(a) $NaNO_3$ (b) KNO_2 (c) $Na_2B_4O_7$ (d) $Na_2CO_3H_2O$

5. **The pH range of the acid rain is:**
(a) 7-6.5 (b) 6.5-6 (c) 6-5.6 (d) Less than 5

6. **Vinyl acetylene combines with HCl to form:**
(a) Chloroprene (b) Benzene (c) Poly acetylene (d) Divinyl acetylene

7. **Laughing gas is chemically:**
(a) NO (b) N_2O (c) NO_2 (d) N_2O_4

8. **Mark the correct statement:**
(a) Na^+ is smaller than Na atom (b) Na^+ is larger than Na atom
(c) Cl^- is smaller than Cl atom (d) Cl^- (ion) and Cl (atom) are equal in size

9. **Which enzyme is not involved in fermentation of starch:**
(a) Urease (b) Zymase (c) Invertase (d) Diastase

10. **Which of these polymers is an addition polyer:**
(a) Nylon-6, 6 (b) Polystyrene (c) Terylene (d) Epoxy resin

11. **Aromatic hydrocarbons are the derivatives of:**
(a) Alkene (b) Benzene
(c) Cyclohexene (d) Normal series of paraffins

12. **Hydrogen bond is the strongest between the molecules of:**
(a) HCl (b) HBr (c) HI (d) HF

13. **Which woody raw material is used for the manufacture of paper pulp:**
(a) Cotton (b) Bagasse (c) Poplar (d) Rice straw

14. **Which set of hybrid orbitals has planar triangular shape:**
(a) dSp^2 (b) Sp^3 (c) Sp^2 (d) Sp

15. **Boric acid cannot be used:**
(a) An antiseptic in medicine (b) For washing eyes
(c) In soda bottles (d) For ena ıels and glazes

16. **Which of the following will have the highest boiling point:**
(a) Mathanal (b) Ethanal (c) Propanal (d) 2-Hexanone

17. **The fibre which is made from acrylonitrile as monomer:**
(a) PVC (b) Rayon fibre (c) Acrylic fibre (d) Polyester fibre

LAHORE BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Define periodic table. How many groups and periods are present in it?
ii. Define (i) Mendeleev's periodic law (ii) Modern periodic law.
iii. Differentiate between alkali metals and alkaline earth metals. Give one example in each case.
iv. Write down the formulas of the following minerals: (i) Borax (ii) Colemanite
v. Write down four uses of borax.
vi. Define chemical garden.
vii. Write down two similarities and two dissimilarities of oxygen and sulphur.
viii. Write four differences of nitrogen from its family.
ix. Why does aqua regia dissolve gold and platinum?
x. Write down four essential qualities of a good fertilizer.
xi. What are raw materials for the manufacture of cement?
xii. Define environmental chemistry. Name components of environment.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Define organic chemistry. What is vital force theory?
ii. Write down structural formulas of the following:
(a) 2-Methyl propane (b) Neopentane
(c) 3-Ethyl pentane (d) 2,2-Dimethyl pentane
iii. Write down four uses of methane.
iv. Define aromatic hydrocarbons. Hwo they are classified?
v. What happens when (a) Benzene is heated with conc. H_2SO_4 at 250^0C.
(c) Chlorine is passed through benzene is sunlight.
vi. Define alkyl halies. What are primary alkyl halides? Give one example.
vii. Define Grignard reagent. Give one example.
viii. How ethanal is prepared from Molasses? Write chemical reaction as well.
ix. Define: (a) Absolute alcohol (b) Methylated spirit
(c) Rectified spirit (d) Denaturing of alcohol.
x. Write down the structural formulae of the following:
(a) Propanoic acid (b) Oxalic acid
(c) Benzoic acid (d) Acetic anthydride
xi. How acetic acid is converted into the methane?
xii. Define amino acids. Give two examples.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is iodized salt?
ii. Why iodine hs metallic luster?
iii. Give four applications of noble gases. iv. What are interstitial compounds?
v. How will you convert ethanal into lactic acid?
vi. How will you distinguish between ethanal and benzaldehyde? Give respective chemical reaction.
vii. How is polyvinyl chloride prepared and give its uses?
viii. How is nylon-6,6 prepared? ix. What is function of DNA and RNA?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Write eight points to describe role of lime in industries.
(b) What are hydrides, describe different types of hydrides?
6. (a) Define corrosion. Explain electrochemical theory of corrosion.
(b) How water is disinfected by chlorine? Write down harmful effects of chlorination of water.
7. (a) What is orbital hybridization? Explain sp^3 hybridization with an example.
(b) Discuss atomic orbital treatment to explain structure of benzene.
8. (a) How can following conversions be carried out:
(i) Ethane → Methane (ii) Methane → Ethane
(b) How can ethers be prepared by Williamsons method and from Ag_2O?
9. (a) How does ethyl magnesium bromide react with:
(i) CO_2 (ii) H_3C-CHO (iii) H_2O (iv) CH_3OH
(b) Describe with mechanism aldol condensation reaction.

SARGODHA BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time : 20

Session (2019) **Objective** Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Which is not a calcarious material?**
(a) Clay (b) Lime (c) Marble (d) Marine Shell

2. **The main pollutant of leather tanneries in the waste water is due to salt of?**
(a) Lead (b) Chromium (c) Copper (d) Chromium (III)

3. **Which is more acidic oxide in the following?**
(a) MnO (b) Mn_2O_3 (c) MnO_2 (d) Mn_2O_7

4. **General name of mineral $MgSO_4.7H_2O$ is?**
(a) Gypsom (b) Dolomite (c) Calcite (d) Epsom salt

5. **Chemical formula of litharge is?**
(a) Pb_2O (b) SiO_3 (c) PbO (d) Pb_3O_4

6. **The lowest ionization energy is possessed by?**
(a) P (b) N (c) Sb (d) As

7. **Which is the strongest oxidizing agent in the following?**
(a) I_2 (b) Cl_2 (c) F_2 (d) Br_2

8. **Which one of these elements is a typical transition element?**
(a) Ni (b) Zn (c) Cd (d) Hg

9. **Number of possible chain isomers of an alkane C_5H_{12} are?**
(a) 2 (b) 3 (c) 4 (d) 5

10. **Structural formula of vinyl chloride is:**
(a) $HC \equiv C-Cl$ (b) $H_2C=CHCl$ (c) $H_3C-CHCl_2$ (d) H_2C-CH_2 with Cl on each carbon (ClH_2C-CH_2Cl)

11. **Which one of the following species is an electron withdrawing?**
(a) $-CH_3$ (b) $-CHO$ (c) $-OH$ (d) $-NH_2$

12. **When ethyl magnesium bromide is reacted with $HCHO$, followed by acid hydrolysis, the product formed is?**
(a) Ethanol (b) I-propanol (c) 2-propanol (d) Ethanoic acid

13. **Which compound will have maximum repulsion with water?**
(a) H_5C_2OH (b) H_3COH (c) C_6H_6 (d) $H_3C-\ddot{O}-CH_3$

14. **Which one of the following compounds will react with Fehling's solution?**
(a) $HCOOH$ (b) $H_3C.CHO$ (c) H_3CCOOH (d) $H_3C-COCH_3$

15. **Chemical formula of glycine is?**
(a) H_3CCOOH (b) $H_3C.CHO$ (c) $H_2N.CH_2COOH$ (d) $H_3C.CO.CH_3$

16. **Which nitrogenous base is not present in RNA?**
(a) Thiamine (b) Cytosine (c) Adenine (d) Uracil

17. **Which of these polymers is a synthetic polymer?**
(a) Animal fat (b) Starch (c) Cellulose (d) Polyester

SARGODHA BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Write two properties of covalent hydrides.
ii. Define Lanthanides and Actinides.
iii. Complete and balance the following equations.
(a) $Li_2CO_3 + heat \Rightarrow$ (b) $NaNO_3 + heat \Rightarrow$
iv. Justify that CO_2 is acidic in nature.
v. How Borax is used as water softening agent.
vi. How H_3BO_3 reacts with (a) C_2H_5OH (b) $NaOH$
vii. What is aqua regia. How is it dissolves the gold.
viii. Write chemical Equations showing effect of temperature on H_3PO_4.
ix. How temperature affects the gaseous Nitrogen di-oxide (NO_2).
x. Why NH_4NO_3 is not used as fertilizer for paddy rice.
xi. What do you mean by setting of cement.
xii. What is Biochemical oxygen demond (BOD).

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Write down the useful by-products obtained in the process of cracking.
ii. What is Clemmensen reduction? Give an example.
iii. Why alkanes are less reactive than alkenes?
iv. Write down the structural formulas of (a) Naphthalene (b) Phenanthrene
v. Write down five resonance structures of benzene.
vi. Give IUPAC names of the following compounds.
(a) $(CH_3)_3C-CH_2-Cl$ (b) $(CH_3)_2CHBr$
vii. What are Grignard's reagents. How are these produced?
viii. How Phenol is prepared by Dow's process?
ix. How Phenol reacts with formaldehyde?
x. Write down the formulas of (a) Palmitic acid (b) iso-Butyric acid
xi. How can you convert acetic acid into (a) Methane (b) Acetyl chloride
xii. Write down the mechanism for the reaction between CH_3COOH and NH_3.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. Complete and balance following equations.
(a) $HClO_4 + P_2O_5 \xrightarrow{-10^{\circ}C}$ (b) $HgO + Br_2 \xrightarrow{50^{\circ}C}$
ii. Write order of acid strength of oxyacids of chlorine.
iii. What happens when bleaching powder reacts with
(a) $conc.H_2SO_4$ (b) NH_3
iv. Give systematic names to following complexes (a) $K_2[PtCl_6]$ (b) $[Co(NH_3)_4]Cl_3$
v. Write industrial method for the preparation of formaldehyde.
vi. What is Cannizzaro's reaction? Give an example.
vii. Define thermoplastic and thermosetting polymers.
viii. What are polyester resins? Give an example with reaction equation.
ix. What is meant by denaturing of proteins.

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) How does the classification of elements in different blocks help in understanding their chemistry.
(b) How is sodium metal extracted by Down's cell? Describe the products formed by this cell on different electrodes by balanced chemical equation.

6. (a) Explain the electrochemical theory for corrosion.
(b) What is smog? Explain the pollutants which are the main causes of photochemical smog.

7. (a) Define Isomerism and explain any two types of structural isomerism with examples.
(b) Discuss the stability of benzene in detail with reference to 1,3,5-cyclohexatriene.

8. (a) Explain the polymerization of acetylene in detail.
(b) Describe the preparation of ethyl alcohol by fermentation of starch and molasses.

9. (a) How does acetaldehyde react with
(i) C_2H_5MgBr (ii) $NaHSO_3$ (iii) NH_2OH (iv) N_2H_4
(b) Write a detailed note on S_N2 reactions of alkyl halides

FAISALABAD BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2019) **Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Mark the correct statement:**
(a) All the lanthanides are present in the same group
(b) All the halogens are present in the same period
(c) All the alkali metals are present in the same group
(d) All the noble gases are present in the same period

2. **Which sulphate is not soluble in water?**
(a) Sodium sulphate (b) Potassium sulphate (c) Zinc sulphate (d) Barium sulphate

3. **Which element is not present abundantly in earth's crust?**
(a) Silicon (b) Aluminium (c) Sodium (d) Oxygen

4. **Which species has the maximum number of unpaired electrons?**
(a) O_2 (b) O_2^+ (c) O_2^- (d) O_2^{2-}

5. **Which halogen occurs naturally in positive oxidation state?**
(a) Fluorine (b) Chlorine (c) Bromine (d) Iodine

6. **Which is a typical transition metal?**
(a) Sc (b) Y (c) Ra (d) Co

7. **In t-butyl alcohol, the tertiary carbon is bonded to:**
(a) Two hydrogen atoms (b) Three hydrogen atoms
(c) One hydrogen atom (d) No hydrogen atom

8. **Vinyl acetylene combines with HCl to form:**
(a) Polyacetylene (b) Benzene (c) Chloroprene (d) Divinyl acetylene

9. **Benzene cannot undergo:**
(a) Substitution reactions (b) Addition reactions
(c) Oxidation reactions (d) Elimination reactions

10. **Grignard reagent is reactive due to:**
(a) The presence of halogen atom (b) The presence of Mg atom
(c) The polarity of C-Mg bond (d) The polarity of Mg-X bond

11. **Which compound will have maximum repulsion with H_2O?**
(a) C_6H_6 (b) C_2H_5OH (c) $CH_3CH_2CH_2OH$ (d) CH_3-O-CH_3

12. **Which of the given compounds will not give iodoform test on treatment with $I_2/NaOH$?**
(a) Acetaldehyde (b) Acetone (c) Butanone (d) 3-pentanone

13. **Which is not a fatty acid?**
(a) Propanoic acid (b) Acetic acid (c) Phthalic acid (d) Butanoic aid

14. **The reaction between fat and NaOH is called:**
(a) Esterification (b) Hydrogenolysis (c) Fermentation (d) Saponification.

15. **Which is a monosaccharide?**
(a) Fructose (b) Sucrose (c) Starch (d) Cellulose

16. **Micro-nutrients are required in quantity ranging from:**
(a) 4-40 g (b) 6-200 g (c) 6-200 kg (d) 4-40 kg

17. **In the purification of potable water the coagulant used is:**
(a) Nickle sulphate (b) Copper sulphate (c) Barium sulphate (d) Alum

FAISALABAD BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. How do you justify the position of hydrogen at the top of group IA?
ii. Why does metallic character increase from top to bottom in a group of metals?
iii. Write any four uses of lime in industries.
iv. Write balanced equations for the reactions of Al with (a) H_2SO_4. (b) NaOH
v. How does borax serve as a water softening agent?
vi. Give the names and formulae of different acids of boron.
vii. Write balanced equations for the reaction of orthophosphoric acid with NaOH.
viii. NO_2 is a strong oxidizing agent. Prove the truth of this statement giving examples.
ix. Complete and balance the given chemical equations.
(a) P+NO $\rightarrow$. (b) $HNO_3 + HI \rightarrow$
x. What is meant by setting of cement? Discuss the reactions taking place in first 24 hours.
xi. What are the prospects of paper industry in Pakistan?
xii. Explain the process of incineration of industrial waste.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. What is the difference between tautomerism and metamerism?
ii. What is raney nickel? Write its function.
iii. Convert CH_4 to $H-COOH$.
iv. Write name of two groups which are called as meta directing group and two groups which are called as ortho, para-directing groups.
v. Write mechanism for sulphonation of benzene.
vi. Convert C_2H_5Br to tetra ethyl lead (TEL). vii. Convert C_2H_5Br to $(C_2H_5)_2NH$
viii. Why absolute alcohol cannot be prepared by fermentation process?
ix. Draw structure of (a) methyl-n-propyl ether (b) methoxy benzene.
x. Write structure of (a) alanine (b) valine.
xi. What is ninhydrin test?
xii. Point out difference between protein and polypeptide.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. How are the halogen acids ionized in water?
ii. What is bleaching powder? Give its two uses.
iii. Describe chemical reactions of bleaching powder with (a) HI (b) CO_2
iv. How does the process of galvanizing protect iron from rusting.
v. Give four uses of acetaldehyde.
vi. How will you distinguish between ethanal and propanal?
vii. What are thermoplastic polymers? Give two examples.
viii. What are lipids? Give their types.
ix. Define saponification number and iodine number.

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Give two similarities and two dissimilarities of hydrogen with elements of group IA.
(b) Write any eight uses of lime in industry.
6. (a) Describe rules for naming the coordination complexes and give one example.
(b) Describe air pollution briefly.
7. (a) What is cracking? Discuss its two tyeps.
(b) Write the classification of aromatic hydrocarbons giving one example of each.
8. (a) Describe Kolbe's method for the preparation of ethyne with reaction mechanism.
(b) Describe Lucas test for the identification of primary, secondary and tertiary alcohols with suitable chemical reactions.
9. (a) Differentiate between S_N1 and S_N2 reactions.
(b) Write one laboratory and one industrial method for the preparation of acetaldehyde.

RAWALPINDI BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time : 20

Session (2019) **Objective** Marks : 17

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Which one of the following is a typical transition metal?**
(a) SC (b) Y. (c) Co (d) Ra

2. **Which set of hybrid orbital has planar triangular shape?**
(a) SP (b) SP^2 (c) SP^3 (d) dSP^2

3. **Formula of chloroform is:**
(a) $CHCl_3$ (b) CH_2Cl_2 (c) CH_3Cl (d) CCl_4

4. **During nitration of benzene, the active nitrating agent is:**
(a) NO_3 (b) NO_2^+ (c) NO_2^- (d) HNO_3

5. **For which mechanism, the first step involved is the same?**
(a) E1 and E2 (b) E2 and S_N2 (c) S_N1 and E2 (d) E1 and S_N1

6. **Ethanol can be converted itno ethanoic acid by:**
(a) Hydrogenation (b) Hydration (c) Oxidation (d) Fermentation

7. **The carbon atom of a carbonyl group is:**
(a) SP^2 hybridized (b) SP^3 hybridized (c) Sp hybridized (d) dSP^2 hybridized

8. **Which reagent is used to reduce carboxylic group to alcoholic group?**
(a) H_2/Ni (b) H_2/Pt (c) H_2/Fe (d) $LiAlH_4$

9. **Which one of the following polymers is an addition polymer?**
(a) nylon-6,6 (b) polystyrene (c) terylene (d) epoxy resin

10. **Micronutrients are required in quantity ranging from:**
(a) 4-40 gm (b) 6-200 kg (c) 6-200 gm (d) 4-40 kg

11. **Peroxyacetylnitrate (PAN) is an irritant to human beings and it affects:**
(a) eyes (b) ears (c) stomach (d) nose

12. **Newspaper can be recycled again and again by how many times?**
(a) 4 (b) 5 (c) 2 (d) 3

13. **Keeping in view the size of atoms, which order is the correct one:**
(a) Mg>Sr (b) Ba> Mg (c) Lu>Ce (d) Cl> I

14. **Tincal is a mineral of:**
(a) Al (b) Si (c) B (d) C

15. **Laughing gas is chemically:**
(a) NO (b) NO_2 (c) N_2O_4 (d) N_2O

16. **Which one of the following hydrogen halides is the weakest acid in aqueous solution?**
(a) HF (b) HCl (c) HBr (d) HI

17. **Which of the following sulphate is insoluble in water?**
(a) Sodium sulphate (b) Potassium sulphate (c) Zinc sulphate (d) Barium sulphate

RAWALPINDI BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2019) **Subjective** **Marks : 68**
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. How do you justify the position of hydrogen at the top of VIIA group?
ii. Why does metallic character increase from top to bottom in a group of metals?
iii. Why does lime water turn milky with CO_2 but becomes clear with excess CO_2?
iv. Give equations to represent the given reaction. Borax is heated with CuO.
v. NO_2 is strong oxidizing agent, prove it with two examples.
vi. P_2O_5 is a powerful dehydrating agent, show it with two exampels.
vii. What are Silicones?
viii. What are Silicates?
ix. Write four uses of HNO_3.
x. What is Biosphere.
xi. What is BOD?
xii. What are Isomers? Write isomers of pentane.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. How acid and base catalyses the reactivity of carboxyl compound?
ii. Write two examples of Monodentate ligands.
iii. Write correct names of compounds by I.U.P.A.C system.
 (a) 4-methyl pentane (b) 3,3,5-Trimethyl hexane
iv. Write effect of branching on melting point of alkanes.
v. What informations do we get from x-ray analysis of benzene.
vi. Convert
 (a) $C_3H_7Cl \Rightarrow CH_3-CH=CH_2$ (b) $C_3H_7Cl \Rightarrow CH_3-CH_2=CH_2OH$
vii. Write down structures of (a) Vinyl alcohol (b) Lactic acid
viii. Point out difference between symmetric and unsymmetric ether.
ix. Write chemistry of chromyl chloride test.
x. Write four uses of farmaldehyde.
xi. Draw structures of (a) Alanine (b) Valine
xii. Draw structures of Dimer of Carboxylic acid.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is meant by degree of polymerization. Give an example.
ii. Write different stages in the manufacture of cement by wet process.
iii. Give trend of oxidizing power of halogens. Write any two factors on which oxidizing power of halogens depends.
iv. Write main raw materials used in the production of pulp and paper in Paksitan.
v. Define saponification number and iodine number of a fat or an oil.
vi. How are polyamide resins prepared? Give an example.
vii. Write any two applications of noble gases.
viii. Write any two methods of preparation of chlorinedioxide.
ix. Write any two essential qualities of a good fertilizer.

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Discuss the position of hydrogen over IA and VII A group of periodic table.
(b) Explain the preparation of Na metal by Down cell.

6. (a) What do you mean by corrosion. Explain electrochemical theory in detail.
(b) Discuss in detail any two components of the environment.

7. (a) Define Isomerism. Explain position isomerism and functional group isomerism with one example each.
(b) Discuss atomic orbital treatment of Benzene.

8. (a) Explain free radical mechanism for the reaction of chlorine with methane in the presence of Sunlight.
(b) Write down important physical properties and uses of phenols. How Bakelite is prepared from it (Phenol)?

9. (a) How will you make the following conversions from ethyl bromide?
 (i) Propane (ii) Propanoic acid (iii) Ethene (iv) Ethyl cyanide
(b) Describe the mechanism of aldolcondensation reaction? Why does formaldehyde not give this reaction?

Answers (Sahiwal Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D	D	B	D	A	D	C	B	C	B	D	B	A	D	B	B	A

Answers (D.G. Khan Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D	D	B	B	C	D	C	D	C	C	C	C	D	C	D	C	A

Answers (Bahawalpur Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	B	C	D	D	D	A	B	B	B	A	C	D	D	C	D	B

Answers (Multan Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
B	D	A	A	B	C	B	B	D	D	D	C	B	D	D	D	A

Answers (Gujranwala Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
B	C	D	C	B	B	C	D	D	C	B	D	D	D	C	D	A

Answers (Lahore Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	C	B	A	D	A	B	A	A	B	B	D	C	C	C	D	C

Answers (Sargodha Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	B	D	D	C	C	C	A	B	B	B	B	C	B	C	A	D

Answers (Faisalabad Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	D	C	A	D	D	D	C	D	C	A	D	C	D	A	B	D

Answers (Rawalpindi Board)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	B	A	B	D	D	A	D	B	C	A	B	B	C	D	A	D

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Board Papers 2021

SAHIWAL BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2021) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Which of the given will have the highest boiling point?**
(a) Methanal (b) Ethanal (c) Propanal (d) 2-Hexanone

2. **Which reagent is used to reduce a carboxylic group to an alcohol?**
(a) H_2/Ni (b) H_2/Pt (c) $NaBH_4$ (d) $LiAlH_4$

3. **Acetic acid is manufactured by:**
(a) Distillation (b) Fermentation (c) Ozonolysis (d) Esterification

4. **Phosphorus helps the growth of:**
(a) roots (b) leaves (c) stem (d) seed

5. **The chemical formula of Fluorospar is:**
(a) $Ca_3(PO_4)_3F$ (b) CaF_2 (c) Na_3AlF_6 (d) $KCl.MgCl_2.6H_2O$

6. **The correct statement is:**
(a) Na^+ is smaller than Na atom (b) Na^+ is larger than Na atom
(c) Cl^- is smaller than Cl atom (d) Cl^- (ion) and Cl (atom) are equal in size

7. **Chile saltpetre has the chemical formula:**
(a) $NaNO_3$ (b) KNO_3 (c) $Na_2B_4O_7$ (d) $Na_2CO_3.H_2O$

8. **Which of the given element is not present abundantly in earth's crust?**
(a) Silicon (b) Aluminium (c) Sodium (d) Oxygen

9. **Laughing gas is chemically:**
(a) NO (b) N_2O (c) NO_2 (d) N_2O_4

10. **Which is the strongest acid?**
(a) $HClO$ (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

11. **Which of the given compound will react with Tollen's reagent?**
(a) $CH_3-\overset{O}{\overset{\|}{C}}-H$ (b) $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ (c) $CH_3-\overset{O}{\overset{\|}{C}}-OH$ (d) $CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_3$

12. **Which compound will have maximum repulsion with H_2O?**
(a) C_6H_6 (b) C_2H_5OH (c) $CH_3CH_2CH_2OH$ (d) CH_3-O-CH_3

13. **Elimination bimolecular reactions involve:**
(a) first order kinetics (b) second order kinetics
(c) third order kinetics (d) zero order kinetics

14. **Which compound is the most reactive one?**
(a) Benzene (b) Ethene (c) Ethane (d) Ethyne

15. **The presence of a double bond in a compound is the sign of:**
(a) saturation (b) unsaturation (c) substitution (d) none

16. **A double bond consists of:**
(a) two sigma bonds (b) one sigma and one pi-bond
(c) one sigma two pi-bonds (d) two pi-bonds

17. **The strength of binding energy of transition elements depends upon number of:**
(a) electron pairs (b) unpaired electrons (c) neutrons (d) protons

SAHIWAL Board

Chemistry (New Scheme)　(Inter Part-II Class 12th)　Time: 2:40 Hours
Session (2021)　(Group-I) Subjective　Marks : 68

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

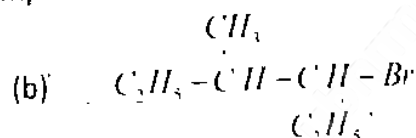
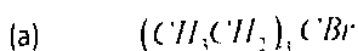
i. What is trend of electron affinity from top to bottom in a group?
ii. Why the ionic radii of negative ions are larger than the size of their parent atom?
iii. Give the advantages of Down's cell for the preparation of sodium metal on commercial scale.
iv. BeO is amphoteric in nature. Justify.
v. What is borax bead test?
vi. Write down any two uses of boric acid.
vii. Give any four uses of Aluminium.
viii. Write down the dissimilarities of oxygen with sulphur (any four).
ix. Why SO_3 dissolves in H_2SO_4, not in water?
x. Why nitrogen is important for plants? Give two name of nitrogenous fertilizers.
xi. Write the reactions involved in preparation of urea fertilizer.
xii. Write down the reaction which takes place in 24 hours during setting of cement.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why HF is weak acid?
ii. Write reactions of chlorine with cold and hot NaOH.
iii. What is meant by available chlorine in bleaching powder? Give reaction.
iv. Define Corrosion.
v. Why compounds of transition elements show colour?
vi. Define Monocyclic and Polycyclic aromatic hydrocarbons.
vii. Define Resonance Energy. Give one example.
viii. Write the reactions of formaldehyde and acetaldehyde with HCN .
ix. Write applications of Iodoform test.
x. How acetic acid is prepared from Grignard's reagent?
xi. Write the reactions of Acetic Acid with NaOH and Na_2CO_3.
xii. Write four uses of Acetic Acid.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is catalytic cracking?
ii. What is meant by functional group? Write the name of two oxygen containing functional groups.
iii. Alkanes are less reactive than Alkenes. Justify.
iv. Define Hydroxylation. Give an example.
v. How may Ethene be converted into ethyl alcohol?
vi. Define Alkyl Halide. Which is the best method of preparing alkyl halides?
vii. Write IUPAC names of the following compounds:

(a) $(CH_3CH_2)_3CBr$　(b) $C_2H_5-\underset{C_2H_5}{CH}-\overset{CH_3}{CH}-Br$

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Justify the position of hydrogen at the top of group I-A by giving any four points of similarities and dissimilarities.
(b) How Lithium shows peculiar behaviour among alkali metals? Mention any eight properties.

6. (a) How does Conc. HNO_3 react with the following metals?
(i) Cu　(ii) Hg　(iii) Sn　(iv) Zn
(b) Explain Electrochemical theory of corrosion.

7. (a) Write four various forms of structural isomerism with examples.
(b) Explain Aldol Condensation with mechanism using a suitable example.

8. (a) Name the following compounds according to IUPAC system:
(i) $(CH_3)_2C=CH_2$　(ii) $(CH_3CH_2)_3CH$　(iii) $HC\equiv C-CH=CH-CH_3$
(iv) $HC\equiv C-\underset{CH_3}{CH}=CH=CH_2$
(b) Give four equations with conditions for the preparation of Alkyl halides from Alcohols.

9. (a) Write Friedel-Craft Alkylation reaction with mechanism.
(b) Starting from phenol prepare the following compounds:
(i) Ortho Hydroxybenzyl Alcohol　(ii) Para Hydroxybenzyl Alcohol
(iii) Bakelite

FAISALABAD BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2021) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **During the manufacturing process of cement the temperature of decomposition zone goes up to:**
(a) $600°C$ (b) $900°C$ (c) $1000°C$ (d) $1200°C$

2. **Carboxylic acids on reduction with HI and red phosphorus gives:**
(a) Alkanes (b) Alcohols (c) Aldehydes (d) Ketones

3. **Which acid is used in the manufacture of synthetic fiber?**
(a) Formic acid (b) Oxalic acid (c) Carbonic acid (d) Acetic acid

4. **The compound used in the processing of anti-polio vaccine is:**
(a) Acetaldehyde (b) Formaldehyde (c) Acetone (d) Ethyl bromide

5. **Formalin is ___________ solution of Formaldehyde in water.**
(a) 10% (b) 20% (c) 40% (d) 60%

6. **Which compound will have maximum repulsion with H_2O?**
(a) C_6H_6 (b) C_2H_5OH (c) $CH_3CH_2CH_2OH$ (d) CH_3-O-CH_3

7. **Which is not a nucleophile?**
(a) H_2O (b) H_2S (c) BF_3 (d) NH_3

8. **The electrophile in aromatic sulphonation is:**
(a) H_2SO_4 (b) HSO_4^- (c) SO_3 (d) SO_3^+

9. **Formula of chloroform is:**
(a) CH_3Cl (b) CCl_4 (c) CH_2Cl_2 (d) $CHCl_3$

10. **A double bond consists of:**
(a) Two sigma bonds (b) One sigma and one pi bond
(c) One sigma and two pi bonds (d) Two pi bonds

11. **The colour of transition metal complexes is due to:**
(a) d-d transition of electrons (b) Paramagnetic nature of transition elements
(c) Ionization (d) Loss of S-electrons

12. **The anhydride of $HClO_4$ is:**
(a) ClO_3 (b) ClO_2 (c) Cl_2O_5 (d) Cl_2O_7

13. **Which halogen is a solid at room temperature and pressure?**
(a) F_2 (b) Cl_2 (c) Br_2 (d) I_2

14. **Among group VA elements, the most electronegative element is:**
(a) Sb (b) N (c) P (d) As

15. **Tincal is a mineral of:**
(a) Al (b) B (c) Si (d) C

16. **Chile Saltpeter has the chemical formula:**
(a) $NaNO_3$ (b) KNO_3 (c) $Na_2B_4O_7$ (d) $Na_2CO_3.H_2O$

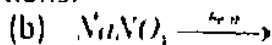
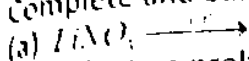
17. **Mark the correct statement:**
(a) Metallic character increases down the group
(b) Metallic character increases from left to right along a period
(c) Metallic character remains the same from left to right along a period
(d) Metallic character remains the same down the group.

FAISALABAD BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time: 2:40 Hours
Session (2021) (Group-I) Subjective Marks : 68
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. (8 × 2 = 16)

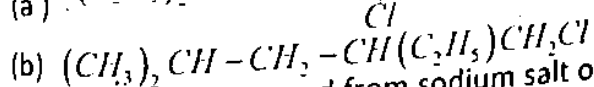
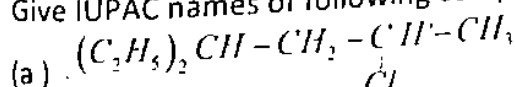
i. Why anionic radius is greater than parent atom?
ii. Diamond is a non-conductor while graphite is a good conductor. Give reason.
iii. Complete and balance the equations:
(a) $LiNO_3 \longrightarrow$ (b) $NaNO_3 \longrightarrow$
iv. Describe two problems during manufacturing of NaOH by diaphragm cell
v. Convert Boric acid into tetra boric acid.
vi. Write the reaction of H_3BO_3 with (a) NaOH (b) Na_2CO_3.
vii. Write any two uses of boric acid.
viii. Write two methods for preparation of nitrogen oxide (NO).
ix. Write any two reactions of H_2SO_4 as an oxidizing agent.
x. How diammonium phosphate is prepared?
xi. Define cement.
xii. Which types of raw material is used in cement? Give their names.

Q.3: Write short answers to any Eight parts. (8 × 2 = 16)

i. Write equations for the reactions of chlorine with hot and cold NaOH.
ii. Give four uses of bleaching powder.
iii. Arrange the oxy acids of halogen in increasing order of their acidic strength.
iv. What is sacrificial corrosion?
v. What are interstitial compounds?
vi. Write mechanism for nitration of benzene.
vii. Convert benzene into (a) Hexachlorocyclohexane (b) Benzene sulphonic acid.
viii. What is Tollen's test?
ix. Write general mechanism for the acid catalysed nucleophilic addition reactions of carbonyl compounds.
x. Write four uses of acetic acid.
xi. Convert acetic acid into (a) Ethane (b) Ethyl alcohol.
xii. Write structural formulae of (a) Malonic acid (b) Phthalic acid.

Q.4: Write short answers to any Six parts. (2 × 6 = 12)

i. Define heterocyclic compounds and give two examples with names.
ii. What is metamerism? Give one example.
iii. Write the structural formulas for these compounds. (a) 3-n-propyl-1, 4-pentadiene (b) But-1-en-3-yne
iv. How will you convert? (a) Ethene into ethyl alcool (b) Ethene into ethyne.
v. Define Markownikov's rule and give one example.
vi. Define allyl halide, which is the best method of preparing allyl halide.
vii. Give IUPAC names of following compounds.

(a) $(C_2H_5)_2CH-CH_2-\underset{Cl}{CH}-CH_3$

(b) $(CH_3)_2CH-CH_2-CH(C_2H_5)CH_2Cl$

viii. How phenol is prepared from sodium salt of benzene sulphonic acid?
ix. Give uses of ethanol. Only four.

Section-II

(3 × 8 = 24)

Note: Attempt any three (3) questions:

5. (a) Describe variation of melting point and boiling point in periods and groups of modern periodic table.
(b) Describe peculiar behaviour of Be.
6. (a) Write preparation and two reactions of HNO_2.
(b) Write a note on these properties of transition elements:
(i) Binding energies (ii) Oxidation state
7. (a) Explain geometrical isomerism with suitable examples.
(b) What is Cannizzaro's reaction? Explain with mechanism.
8. (a) Describe any four methods for the preparation of alkenes.
(b) What is B-Elimination reaction? Explain E_2 reaction in detail.
9. (a) What are Friedel and Craft's reactions? Give one example in each case with mechanism.
(b) How will you obtain pure ethanol by fermentation of starch.

GUJRANWALA BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2021) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Micro-nutrients are required in quantity ranging from**
(a) 4-40 g (b) 6-200 g (c) 6-200 kg (d) 4-40 kg

2. **Which of the following is not a fatty acid?**
(a) propanoic acid (b) acetic acid (c) phthalic acid (d) butanoic acid

3. **The solution of which acid is used for seasoning of food?**
(a) formic acid (b) acetic acid (c) benzoic acid (d) butanoic acid

4. **Which of the following compounds will not give iodoform test on treatment with $I_2 / NaOH$?**
(a) acetaldehyde (b) acetone (c) butanone (d) 3-pentanone

5. **Which one of the following compounds will react with Fehling's solution?**
(a) C_2H_5COOH (b) CH_3CHO (c) CH_3COOH (d) CH_3COOH_3

6. **Which compound shows maximum hydrogen bonding with water?**
(a) CH_3OH (b) C_2H_5Cl (c) CH_3-O-CH_3 (d) C_6H_5OH

7. SN_2 reactions can be best carried out with
(a) primary alkyl halides (b) secondary alkyl halides
(c) tertiary alkyl halides (d) all of these

8. **The benzene molecule contains**
(a) three double ponds (b) two double bonds
(c) one double bond (d) delocalized π-electron charge

9. **Select from the following the one which is alcohol**
(a) CH_3-CH_2-OH (b) CH_3-O-CH_3 (c) CH_3COOH (d) CH_3-CH_2-Br

10. $\beta-\beta'$ **– dichloroethyl sulphide is commonly known as**
(a) laughing gas (b) mustard gas (c) phosgene gas (d) bio-gas

11. **The strength of binding energy of transition clements depends upon:**
(a) number of electron pairs (b) number of unpaired electrons
(c) number of neutrons (d) number of protons

12. **Which is the strongest acid?**
(a) $HClO$ (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

13. **The halogen with the lowest melting and boiling points is**
(a) fluorine (b) chlorine (c) bromine (d) iodine

14. **Which of the following species has the maximum number of unpaired electrons?**
(a) O_2 (b) O_2^+ (c) O_2^- (d) O_2^{2-}

15. **Which element belongs to group IVA of the periodic table?**
(a) barium (b) iodine (c) lead (d) oxygen

16. **The oxide of Beryllium is**
(a) acidic (b) basic (c) amphoteric (d) none of these

17. **Which one of basicthe following has the lowest melting point?**
(a) Be (b) Mg (c) Ca (d) Sr

GUJRANWALA BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time: 2:40 Hours
Session (2021) (Group-I) Subjective Marks : 68
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why the size of an anion is larger than its neutral atom?
ii. What is the role of shielding effect on ionization energy?
iii. Write down electronic configuration of Na and Ca.
iv. Why the group I-A elements are called alkali metals?
v. Give four uses of borax.
vi. Write down two points about the peculiar behaviour of carbon from its group.
vii. What happens when borax is heated with NH_4Cl. Write down balanced equation.
viii. Write down formulas of the following minerals:
(a) Galena (b) Heavy Spar
ix. Sulphuric acid is a dehydrating agent. Prove it by giving two equations.
x. Briefly describe the role of nitrogen in plants.
xi. Write down the major steps involved in the synthesis of urea fertilizer.
xii. What are the raw materials used in the manufacture of cement?

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Prepare Cl_2O_7 with the help of chemical reaction.
ii. Prepare $HClO_4$. Also write down its two properties.
iii. Write down any four uses of bleaching powder.
iv. Write down the name of any four methods for prevention of corrosion.
v. How Zinc coating or anode coating prevents the iron from corrosion?
vi. Describe the x-rays structure of benzene.
vii. Prepare benzene and toulene from alkane with equation.
viii. Write down the reaction of acetone with 2, 4 - dinitrophenylhydrazine.
ix. Write down any four uses of acetaldehyde.
x. How acetic acid is prepared from acetylene?
xi. Write down the chemical reaction of CH_3COOH with (i) C_2H_5OH (ii) NH_3
xii. How would you convert acetic acid into acetic anhydride?

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. Define geometric isomerism giving one example.
ii. What are aliphatic compounds? Give their two examples.
iii. What is clemmensen reduction? Give example.
iv. Convert (a) Methane into ethane (b) Ethene into ethylene glycol.
v. State Markonikow's Rule with an example.
vi. Define nucleophile and substrate. Giving one example in each case.
vii. Convert ethyl chloride into (a) Ethane (b) Tetraethyl Lead
viii. What is denaturing of alcohol?
ix. How will you distinguish between ethanol and methanol by a chemical test?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Define electron affinity. How does it vary in groups and periods generally in the periodic table.
(b) Give the formula of Sylvite, Borax, Trona, Natron, Dolomite, Alunite, Asbestos and Barite.

6. (a) Discuss the preparation of nitric acid by Birkeland and Eyde's process.
(b) Discuss the binding energies and oxidation states of transition elements.

7. (a) Write down note on reforming of gasoline.
(b) Explain oxidation of aldehydes and ketones with two examples in each case.

8. (a) How alkanes can be prepared by Kolbe's electrolytic method. Write down its mechanism.
(b) What is β-Elimination reaction? Differentiate between E_1 and E_2 elimination reactions.

9. (a) Describe Kekule's structure of benzene.
(b) How does ethanol react with
(i) Na (ii) PCl_5 (iii) CH_3MgI (iv) $SOCl_2$

SARGODHA BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2021) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Mark the correct statement:**
(a) Metallic character increases down the group
(b) Metallic character increase from left to right in a period
(c) Metallic character remains the same down the group
(d) Metallic character remains the same from left to right in a period.

2. **Down's cell is used to prepare**
(a) Sodium carbonate (b) Sodium metal (c) Sodium bicarbonate (d) Sodium hydroxide

3. **Which element forms ion with charge +3**
(a) Be (b) Al (c) Si (d) C

4. **Among group VA elements, the most electronegative element is**
(a) Sb (b) N (c) P (d) AS

5. **Which is the strongest acid in aquous solution**
(a) $HClO$ (b) $HClO_3$ (c) $HClO_2$ (d) $HClO_4$

6. **The anhydride of $HClO_4$ is**
(a) ClO_4 (b) ClO_3 (c) Cl_2O_3 (d) Cl_2O_7

7. **Which of the following is a non typical transition element**
(a) Cr (b) Mn (c) Zn (d) Fe

8. **Select from the following the one which is alcohol?**
(a) CH_3-CH_2-Br (b) CH_3-CH_2-OH (c) $H_3C-O-CH_3$ (d) $H_3C-COOH$

9. **β,β' – dichloroethyl sulphide is commonly known as**
(a) Mustard gas (b) Laughing gas (c) Phosgene gas (d) Bio-gas

10. **Which one of the following groups is meta director**
(a) $-OH$ (b) $-NH_2$ (c) $-NO_2$ (d) $-OCH_3$

11. **Which one of the following is not a nucleophile?**
(a) H_2O (b) H_2S (c) BF_3 (d) NH_3

12. **Methyl alcohol is not used as**
(a) A solvent (b) An anti-freezing agent
(c) A substitute for petrol (d) Denaturing agent

13. **Formalin is**
(a) 10 % solution of formaldehyde in water (b) 20 % solution of formaldehyde in water
(c) 40 % solution of formaldehyde in water (d) 60 % solution of formaldehyde in water

14. **Acetone reacts with HCN to form a cyanohydrin is an example of**
(a) Electrophilic addition reaction (b) Electrophilic reaction
(c) Nucleophilic addition reaction (d) Nucleophilic substitution reaction

15. **Which acid is used in the manufacture of synthetic fibre.**
(a) Malonic acid (b) Acetic acid (c) Oxalic acid (d) Phthalic acid

16. **Which of the following derivative cannot be prepared directly from acetic acid.**
(a) Acetamide (b) Acetylchloride (c) Ethylacetate (d) Acetic anhydride

17. **For which crop ammonium nitrate fertilizer. is not used**
(a) Cotton (b) Wheat (c) Sugar cane (d) Paddy rice

SARGODHA Board

Chemistry (New Scheme) (Inter Part-II Class 12th) Time: 2:40 Hours
Session (2021) (Group-I) Subjective Marks : 68

Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. (8 × 2 = 16)

i. The hydration energies of the ions are in the following order. Why? $Al^{+3} > Mg^{+2} > Na^{+1}$

ii. Lanthanide contraction controls the atomic sizes of elements of 6th and 7th periods.

iii. What is the effect of heat on $CaSO_4.2H_2O$?

iv. The reaction of alkali metal oxide with water is an acid-base reaction and not an oxidation reduction reaction, why?

v. How carbon differs from remaining members of group IV-A elements.

vi. What are the common properties of group IV-A elements.

vii. Give two uses of Boric acid.

viii. Give two reactions for the preparation of Dinitrogen oxide (N_2O).

ix. Give equation to describe the reaction of NO_2 with H_2S and KI.

x. What is meant by prilling?

xi. Describe the composition of a good portland cement.

xii. What are essential nutrient elements and why these are needed for plant growth?

Q.3: Write short answers to any Eight parts. (8 × 2 = 16)

i. Why HF is weaker acid than HCl?

ii. Draw Structural formula of OF_2 and O_2F_2.

iii. What is the oxidation state of chlorine in $HClO_4$ and $HClO$?

iv. What is Paramagnetism? Give example.

v. Discuss Cathode Coating.

vi. Draw resonance Structures of Benzene.

vii. Convert n-Hexane into Benzene.

viii. What is the composition of formalin?

ix. How would you differentiate between methanol and Ethanol?

x. How acetic Acid is prepared from Acetylene?

xi. Name the Esters which produce Jasmine and Pineapple flavours.

xii. "Boiling point of Carboxylic Acid is relatively high" Justify.

Q.4: Write short answers to any Six parts. (2 × 6 = 12)

i. Define functional group, Give one example.

ii. Differentiate between catalytic and steam cracking.

iii. Discuss reactivity of π – bond.

iv. Give mechanism of bromination of ethene.

v. Write industrial preparation of ethyne.

vi. Write any four differences between E_1 and E_2 reactions.

vii. Define electrophile and nucleophile.

viii. Discuss the denaturing of alcohol.

ix. How is Bakelite prepared? Give reaction.

Section-II

Note: Attempt any three (3) questions: (3 × 8 = 24)

5. (a) Define ionization energy, on what factors it depends. Give its periodic trend.
   (b) Describe Commercial preparation of sodium metal by Down's Cell.

6. (a) H_2SO_4 is a dehydrating agent and oxidizing agent, prove this truth by giving two examples of each.
   (b) Describe following general characteristics of transition elements.
   (i) Melting and boiling point. (ii). Covalent and ionic radii.

7. (a) Explain the Structures of Ethane and ethyne base on hybridization.
   (b) What is cannizarro's reaction? Give its mechanism.

8. (a) Give any two methods of preparation of alkene (ethen) and also give two oxidation reactions of ethane.
   (b) Differentiate between S_N1 and S_N2 reactions.

9. (a) Explain the comparison of reactivities of Alkanes, Alkenes & Benzene.
   (b) How will you convert phenol into
   (i). Benzene (ii). Picric Acid (iii). Cyclohexanol (iv) Bakelite

MULTAN BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2019) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. Out of all the elements of group VA the highest ionization energy is possessed by:
(a) N (b) P (c) Sb (d) Bi

2. Which of the following hydrogen halide is the weakest acid in the solution?
(a) HF (b) HBr (c) HI (d) HCl

3. Hydrogen Bond is the strongest between the molecules of:
(a) HI (b) HF (c) HCl (d) HBr

4. Which of the following is a non-typical transition element?
(a) Cr (b) Mn (c) Zn (d) Fe

5. The chemist who synthesized urea from ammonium cyanate was:
(a) Berzelius (b) Kolbe (c) Wholer (d) Lavoisier

6. Synthetic rubber is made by polymerization of
(a) Chloroform (b) Acetylene (c) chloroprene (d) Divinylacetylene

7. Which of the following acids can be used as a catalyst in Friedal-Craft reactions?
(a) $AlCl_3$ (b) HNO_3 (c) $BeCl_2$ (d) $NaCl$

8. The rate of E1 reaction depends upon:
(a) The concentration of substrate (b) The concentration of nucleophile
(c) The concentration of substrate as well as nucleophile (d) None of these

9. Which compound will have maximum repulsion with water?
(a) CH_3CH_2OH (b) $CH_3CH_2CH_2-OH$ (c) C_6H_5-OH (d) C_6H_6

10. Cannizzarro's reaction is not given by:
(a) Formaldehyde (b) Acetaldehyde (c) Benzaldehyde (d) Trimethylacetaldehyde

11. Which of the following compounds will react with Tollen's Reagent?
(a) CH_3COH (b) CH_3COCH_3 (c) CH_3COOH (d) $CH_3.CO.CH_2.CH_3$

12. The solution of which acid is used for seasoning of food?
(a) Formic acid (b) Benzoic acid (c) Acetic acid (d) Butanoic acid

13. A carboxylic acid contains:
(a) A carboxylic group (b) A hydroxyl group (c) Alcoholic group (d) Keto group

14. For which crop, ammonium nitrate fertilizer is not used:
(a) Sugar cane (b) Paddy Rice (c) Cotton (d) Wheat

15. Mark the correct statement:
(a) Metallic character remains same down the group
(b) Metallic character remains the same from left to right along a period
(c) Metallic character increases from left to right along a period
(d) Metallic character increases down the group

16. Chile saltpetre has the chemical formula:
(a) $NaNO_3$ (b) KNO_3 (c) KNO_2 (d) KNO

17. Which metal is used in the thermit process because of its reactivity?
(a) Iron (b) Zinc (c) Aluminium (d) Copper

MULTAN Board

Chemistry (New Scheme) (Inter Part-II Class 12th) Time: 2:40 Hours
Session (2021) (Group-I) Subjective Marks : 68

Note: Section I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Define electron affinity with example.
ii. Give two resemblances of Hydrogen with group-IV elements.
iii. Give chemical formula of Chrysoberyl and Asbestos.
iv. Give two advantages of Down's Cell.
v. Write two similarities between Carbon and Silicon.
vi. Which property of Aluminium is useful in flash photography?
vii. Discuss the Chemistry of Borax Bead Test.
viii. How Aqua Regia reacts with Gold?
ix. How Arsenic is removed in contact process?
x. Which raw material is used in the manufacturing of Cement?
xi. Give two benefits of Phosphatic fertilizers.
xii. Why 2% Gypsum is added into Cement?

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Name the factors affecting the oxidizing power of halogens.
ii. Write any four properties of HF.
iii. Give reaction of chlorine with cold and hot/ NaOH.
iv. Define paramagnetic and diamagnetic substances.
v. What are d-d transitions in complexes?
vi. Write objections to Kekule's formula of Benzene.
vii. How is benzene prepared from acetylene?
viii. Give any two applicatons of iodoform test.
ix. Write two uses of Formaldehyde.
x. What happens when the following compounds are heated?
(a) Calcium Acetate (b) Ammonium Acetate.
xi. How acetic acid is converted to ethanol and ethane?
xii. Give reaction to prepare carboxylic acid from Grignard's reagent.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What are alicyclic and aromatic compounds, give one example of each.
ii. Define Metamerism, give an example.
iii. State Markownikov's rule. Give one example.
iv. Give the formation of 1, 1 - Dibromoethane from alkyne.
v. How would you prepare the following compounds from ethyl bromide?
(a) Ethyl alcohol (b) Ethyl Cyanide
vi. Define electrophile. Give its examples.
vii. Write down two reactions or alcohol in which C 0 bond is broken.
viii. What is Lucas test?
ix. What is Raney Nickel? How it can be prepared?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Justify the position of hydrogen at top of group IA and IVA.
(b) Describe occurrence of alkali metals and alkaline earth metals in nature.
6. (a) Explain Electrochemical Theory about Corrosion.
(b) How Sulphuric acid is prepared on commercial scale by contact process?
7. (a) What is meant by orbital hybridization? Explain SP^3 Hybridization with an example.
(b) What types of aldehydes give Cannizzaro's reaction? Give its mechanism.
8. (a) Describe Kolbe's Electrolytic method with mechanism for the preparation of Ethane.
(b) Differentiate between S_N1 and S_N2 reactions.
9. (a) Explain modern structure of Benzene with atomic orbital treatment.
(b) How C_2H_5OH is prepared from molasses and starch? Write with balance equation.

BAHAWALPUR BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2019) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. Mark the correct statement :
(a) All Lanthanides are present in the same group.
(b) All Halogens are present in the same period.
(c) All the Alkali Metals are present in the same group.
(d) All the Noble Gases are present in the same period.

2. Laughing Gas is chemically :
(a) NO (b) N_2O (c) NO_2 (d) N_2O_4

3. Which Element forms an Ion with charge + 3 :
(a) Beryllium (b) Aluminium (c) Carbon (d) Silicon

4. Which of the following Sulphate is not soluble in water :
(a) Sodium Sulphate (b) Potassium Sulphate (c) Zinc Sulphate (d) Barium Sulphate

5. Chlorine Heptaoxide (Cl_2O_7) reacts with water to form:
(a) Hypochlorous Acid (b) Chloric Acid (c) Perloric Acid (d) Chlorine and Oxygen

6. The State of Hybridization of Carbon Atom in Methane is:
(a) sp^3 (b) sp^2 (c) sp (d) dsp^2

7. Which of the given is a typical transition metal:
(a) Sc (b) Y (c) Ra (d) Co

8. Which one is Chlorous Acid :
(a) HClO (b) $HClO_2$ (c) $HClO_3$ (d) $HClO_4$

9. Vinyl acetylene combines with HCl to form:
(a) Polyacetylene (b) Benzene (c) Chloroprene (d) Divinyl Acetylene

10. Which Compound is called Universal Solvent:
(a) H_2O (b) CH_3OH (c) C_2H_5OH (d) CH_3-O-CH_3

11. For which Mechanisms, the first step involved is the same:
(a) E_1 and E_2 (b) E_2 and S_N2 (c) S_N1 and E_2 (d) E_1 and S_N1

12. Amongst the following, the compound that can be most readily Sulphonated is:
(a) Toluene (b) Benzene (c) Nitrobenzene (d) Chlorobenzene

13. Acetone reacts with HCN to form a Cyanohydrin . It is an example of :
(a) Electrophilic Addition (b) Electrophilic Substitution
(c) Nucleophilic Addition (d) Nucleophilic Substitution

14. The flavour of Octylacetate is :
(a) Orange (b) Apricot (c) Banana (d) Jasmine

15. Micro Nutrients :re required in quantity ranging from :
(a) 4 - 40 g (b) 6 - 200 g (c) 6 - 200 Kg (d) 4 - 40 Kg

16. Aldol Conde .ation is given by :
(a) Acetaldehyde (b) Formaldehyde (c) Benzaldehyde (d) Trimethyl Acetaldehyde

17. The solution of which Acid is used for seasoning of food:
(a) Formic Acid (b) Acetic Acid (c) Benzoic Acid (d) Butanoic Acid

BAHAWALPUR BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th)
Session (2021) (Group-II) Subjective
Time: 2:40 Hours
Marks : 68

Note: Secction I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Write essential features of 4th and 5th Period in Periodic Table.
ii. Describe some families in Periodic Table.
iii. Write the Chemical Formulae of: (a) Calcite (b) Barite
iv. Why is the Aqueous Solution of Na_2CO_3 is Alkaline in Nature?
v. Write the Chemical Formulae of (a) Corundum (b) Cryolite
vi. Write two methods for preparation of Borax.
vii. Write the chemistry of Borax Bead Test.
viii. Describe the properties of White Phosphorus.
ix. Complete the Balance the Equations: (a) $Cu + H_2SO_{4(conc)} \rightarrow$ (b) $Zn + H_2SO_{4(dil)} \rightarrow$
x. Write the name and uses of Micronutrients used in Growth of Plants.
xi. What is the function of Nitrogenous Fertilizers for the Growth of Plants?
xii. Write any four essential features of Good Fertilizers.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Write four factors on which Oxidizing Behaviour of Halogens depend.
ii. Why is HF weaker acid than other Halogen Acids?
iii. Write down four uses of bleaching Powder.
iv. What are Interstitial Compounds?
v. Why does Damaged Tin Plated Iron get rusted quickly?
vi. Write down mechanism for Nitration of Benzene.
vii. Write down resonance contributing structures for Benzene.
viii. Write equations for the reactions of Acetaldehyde with:
(a) $NaHSO_3$ (b) HCN
ix. Write down general mechanism for Acid Catalysed Nucleophilic addition reaction of Carbonyl Compounds.
x. Write down four uses of Acetic Acid.
xi. What are Fatty Acids? Give their two examples.
xii. Convert Acetic Acid into: (a) Ethyl Alcohol (b) Ethane

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. Why there is no free rotation around a Carbon-Carbon Double Bond?
ii. What is meant by a Functional Group? Give the general formula of Functional Group of Mercaptanes and Nitriles.
iii. How will you convert: (a) Acetic Acid to Ethane (b) Methane to Ethane
iv. Name the following compounds by IUPAC System:
(a) $CH_2 = CH - C \equiv C - CH = CH_2$ (b) $CH \equiv C - CH = CH - C \equiv CH$
v. Write down Chemical Equations for the preparation of Propene from:
(a) n- Propyl Alcohol (b) iso-Propyl Chloride
vi. How Tetramethyl Lead and Tetraethyl Lead are prepared?
vii. Describe Wurtz Synthesis for the preparation of Alky Halides.
viii. What is the action of given on Phenol: (a) HNO_3 (b) Zn (dust)
ix. Why the boiling points of Alcohols are higher than Corresponding Alkanes?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Define Electron Affinity. Discuss its trends in Periodic Table.
(b) Explain preparation of Sodium by Down's Cell.
6. (a) Discuss reactions of Sulphuric Acid as a Dehydrating Agent.
(b) Define Corrosion. How Electrochemical Theory explains Corrosion?
7. (a) Define sp Hybridization. Explain the structure of Ethyne on the basis of sp-Hybridization.
(b) How will you identify Carbonyl Compounds (Aldehyde and Ketones) using any four reactions?
8. (a) How will you prepare Acetylene from: (i) Vicinal Dihalide (ii) Tetrahalide
(b) What is $\beta -$ Elimination Reaction? Explain E_1 reaction in detail.
9. (a) Benzene is Stable Molecule. Explain by using Hydrogenation Energy.
(b) Give Oxidation Reactions of Primary, Secondary and Tertiary Alcohols in detail.

RAWALPINDI BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Marks : 17
Session (2019) **Objective**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. **Which of the following halogen is weak oxidizing agent?**
(a) Cl_2 (b) F_2 (c) I_2 (d) Br_2

2. **Which of the following is a typical transition element?**
(a) Sc (b) Y (c) Ra (d) Co

3. **The state of hybridization of carbon atom is methane is:**
(a) sp^3 (b) sp^2 (c) sp (d) dsp^2

4. **Formula of chloroform is:**
(a) CCl_4 (b) $CHCl_3$ (c) CH_2Cl_2 (d) CH_3Cl

5. **The electrophile in aromatic sulphonation is:**
(a) H_2SO_4 (b) BF_3 (c) SO_3 (d) SO_3^+

6. **Elimination bimolecular reaction involves:**
(a) First order kinetics (b) Second order kinetics
(c) Third order kinetics (d) zero order kinetics

7. **Which compound shows hydrogen bondings?**
(a) C_2H_6 (b) CH_3-O-CH_3 (c) C_2H_5Cl (d) C_2H_5OH

8. **Percentage of water in Formalin is:**
(a) 52% (b) 8% (c) 40% (d) 60%

9. **Which of the following will have the highest boiling point?**
(a) Methanal (b) Ethanal (c) Propanal (d) 2-Hexanone

10. **Which of the following ester gives apricot flavour?**
(a) Amyl acetate (b) Benzyl acetate (c) Amyl butyrate (d) Otyl acetate

11. **The solution of which acid is used for seasoning of food?**
(a) Formic acid (b) Acetic acid (c) Benzoic acid (d) Butanoic acid

12. **Through how many zones does the charge pass in a rotary kiln?**
(a) 4 (b) 3 (c) 2 (d) 5

13. **Keeping in view the size of atoms, which order is the correct one?**
(a) $Mg > Sr$ (b) $Ba > Mg$ (c) $Lu > Ce$ (d) $Cl > I$

14. **Which ion will have the maximum value of heat of hydration?**
(a) Na^+ (b) Cs^+ (c) Ba^+ (d) Mg^{+2}

15. **Which element belongs to group IVA of the periodic table?**
(a) Ba (b) I (c) Pb (d) O

16. **Which of the following catalyst is used in contact process:**
(a) FeO_3 (b) V_2O_5 (c) SO_3 (d) Ag_2O

17. **The anhydride of $HClO_4$ is:**
(a) ClO_3 (b) ClO_2 (c) Cl_2O_5 (d) Cl_2O_7

RAWALPINDI BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time: 2:40 Hours**
Session (2021) **Subjective** **Marks : 68**

Note: Secotion I Is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why the second value of ionization energy is always greater than first ionization energy values?
ii. The hydration energies of Ions are in the given order: $Al^{+3} > Mg^{+2} > Na^{+}$. Explain.
iii. Write down the problems faced during the working of diaphragm cell.
iv. What happens when Lithium hydride is treated with water? Give reaction.
v. What is the action of an aqueous solution of borax on litmus and why?
vi. How does Aluminium react with non-metals? Give any two reactions.
vii. Phosphorus element can form five covalent bonds; nitrogen cannot, why?
viii. What is Laughing gas? How is it prepared? Give one reaction.
ix. Discuss the peculiar behaviour of Carbon.
x. Give the importance of Nitrogen fertilizers.
xi. Write down the steps for the manufacturing of urea.
xii. Describe the composition of good portland cement.

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Compare the physical states and colours of halogens at room temperature.
ii. What is the reason for variations of oxidation states of transition elements?
iii. What happens when the given compounds are heated?
(a) Calcium Acetate. (b) Ammonium Acetate.
iv. Write down the Mechanism of the reaction between acetic acid and ethanol.
v. How Iodoform is prepared from acetaldehyde and Ethyl alcohol?
vi. Prepare m-chloronitrobenzene from benzene in two steps.
vii. Why HF is weaker acid than HCl?
viii. What are interstitial compounds?
ix. Halogens are strong oxidizing agents. Justify.
x. What are fatty acids? Give an example.
xi. Give mechanism of nitration of benzene.
xii. Write four important uses of Acetaldehyde.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is the excellent method for the preparation of Alkyl iodide?
ii. Write reactions of methyl chloride and ethyl chloride with Sodium Lead Alloy.
iii. What do yon know about the Vital Force Theory?
iv. What is Stream Greeking?
v. Why Alkanes are also called Paraffins?
vi. What is hydrogenolysis? Give an example.
vii. Give two uses of Methane.
viii. Give classification of Monohydric Alcohols.
ix. What do you know about Denaturing of Alcohol?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Write the essential features of all periodics in periodic table.
(b) Write the peculiar behaviour of "Be".
6. (a) Write down two reactions in which HNO_3 acts as an oxidizing agent and two reactions in which HNO_3 acts as reducing agent.
(b) Write four common properties of transition elements.
7. (a) What is Isomerism? Discuss position isomerism and geometrical isomerism.
(b) How does acetaldehyde react with (i) CH_3CH_2MgBr (ii) $NaHSO_3$ (iii) NH_2OH (iv) N_2H_4
8. (a) Explain Halogenation of Alkanes with mechanism.
(b) Differentiate between E_1 and E_2 reactions.
9. (a) Write any four methods of preparation of Benzene.
(b) Write reactions of alcohol in which C-O bond and O-H bond breaks (Two reactions in each case).

D. G KHAN BOARD

Chemistry (New Scheme) **(Inter Part-II Class 12th)** **Time : 20**
Session (2019) **(Group-I) Objective** **Marks : 17**

Note: You have choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number with marker or pen. Cutting or filling two or more circles will result in zero mark in that question.

Q.1: Answer all the following Multiple Choice Questions.

1. Mark the correct statement
(a) The ionization energy of calcium is lower than that of barium
(b) The ionization energy of calcium is lower than that of magnesium
(c) The ionization energy of calcium is higher than that of berylliums
(d) The ionization energy of calcium is lower than that of strontium

2. Which of the following sulphates is not soluble in water?
(a) Sodium sulphate (b) Potassium sulphate (c) Barium sulphate (d) Zinc sulphate

3. Boric acid cannot be used
(a) As antiseptic in medicine (b) For washing eyes
(c) In soda bottles (d) For enamels and glazes

4. Which catalyst is used in contact process ?
(a) Fe_2O_3 (b) V_2O_5 (c) SO_3 (d) Ag_2O

5. The anhydride of $HClO_4$ is
(a) ClO_3 (b) ClO_2 (c) Cl_2O_7 (d) Cl_2O_5

6. Which of the following represents the correct electronic configuration of the outer most energy level of an element of (VIIA) in the ground state?
(a) S^2P^2 (b) S^2P^4 (c) S^2P^5 (d) S^2P^6

7. Group VIB of the transition elements contains
(a) Zn, Cd, Hg (b) Fe, Ru, Os (c) Cr, Mo, W (d) Mn, Te, Re

8. Ethers show the phenomenon of
(a) Position isomerism (b) Functional group isomerism
(c) Metamerism (d) Cis-Trans isomerism

9. The addition of unsymmetrical reagent to an unsymmetrical alkene follows the rule
(a) Hund's Rule (b) Pauli's Exclusion principle
(c) Markownihoff s Rule (d) Aufbau Principle

10. The electrophile in aromatic sulphonation is
(a) H_2SO_4 (b) HSO_4 (c) SO_3^+ (d) SO_3

11. Which one of the following is not a nucleophile?
(a) H_2O (b) H_2S (c) NH_3 (d) BF_3

12. Which compound shows hydrogen bonding?
(a) C_2H_6 (b) C_2H_5Cl (c) CH_3-O-CH_3 (d) CH_3CH_2-OH

13. Formalin is
(a) 60 % solution of formaldehyde in water (b) 10 % solution of formaldehyde in water
(c) 20 % solution of formaldehyde in water (d) 40 % solution of formaldehyde in water

14. The carbon atom of a carbonyl group is
(a) SP-hybridized (b) SP^2-hybridized (c) SP^3-hybridized (d) dSP-hybridized

15. Acetic acid is manufactured by
(a) Distillation (b) Fermentation (c) Ozonolysis (d) Esterification

16. Which acid is used in the manufacture of synthetic fibre ?
(a) Formic acid (b) Oxalic acid (c) Carbonic acid (d) Acetic acid

17. Micro Nutrients are required in a quantity ranging from
(a) 6 - 200 kg (b) 6 - 200 g (c) 4 - 40 kg (d) 60 - 400 kg

D. G KHAN BOARD

Chemistry (New Scheme) (Inter Part-II Class 12th) Time: 2:40 Hours
Session (2021) (Group-I) Subjective Marks : 68
Note: Secotion I is compulsory, Attempt any 3 questions from Section II.

Section-I

Q.2: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. Why Na^+ is smaller than Na atom?
ii. What do you know about S-block Elements ? Give two examples.
iii. Give two properties of Alkaline Earth metals.
iv. Give chemical formulas of Sylvite and Spodumene.
v. What happens when Borax is dissolved in water?
vi. Give two uses of Boric Acid.
vii. Give two points regarding peculiar behaviour of carbon.
viii. Give two methods of preparation of NO_2.
ix. Give two dissimilarities between oxygen and sulphur.
x. What are nitrogeneous fertilizers ? Give two examples.
xi. Why potassium fertilizers are important for plants? Give one example of a potassium fertilizer.
xii. Define cement. Why is it called Portland cement?

Q.3: Write short answers to any Eight parts. **(8 × 2 = 16)**

i. How does oxidation state of halogen affect the acidic strength of oxyacids of halogen?
ii. Write factors affecting the oxidizing power of halogens.
iii. Write reactions of chlorine with cold and hot NaOH.
iv. Define substitutional alloys and give one example.
v. Why transition elements show colour?
vi. Write objections to Kekule's formula of benzene.
vii. Compare the reactivity of benzene and alkene.
viii. How will you distinguish between methanal and ethanal?
ix. Write chemistry of Fehling's solution test.
x. Write reactions of acetic acid with (a) PCl_5 (b) $SOCl_2$
xi. Give mechanism of esterification.
xii. Write manufacture of acetic acid from acetylene.

Q.4: Write short answers to any Six parts. **(2 × 6 = 12)**

i. What is octane number of Gasoline?
ii. What is catalytic cracking?
iii. What is Sabatier-Senden's reaction ? Give its industrial importance.
iv. What is Clemmensen and Wolf-Kishner's reduction reaction?
v. What is Wurtz synthesis ? Give its reaction.
vi. Draw structure of primary , secondary and tertiary alkyl halide from the given compound $C_6H_{13}Cl$.
vii. Give the formation of ortho and para hydroxy benzene sulphonic acid from phenol.
viii. Why phenol is more acidic than that of alcohol?
ix. How will you convert methane into ethane?

Section-II

Note: Attempt any three (3) questions: **(3 × 8 = 24)**

5. (a) Write similarities and differences of Halogens with Hydrogen.
(b) Explain construction and working of Diaphragm cell.
6. (a) Briefly explain the following general characteristics properties of transition elements
(i) Paramagnetism (ii) Binding Energies
(b) What are dehydrogenating agents ? Give any four reactions in which sulphuric acid play the role of dehydrating agent.
7. (a) Write a note on the cracking of Hydrocarbons.
(b) What types of Aldehydes give Cannizzaro's reaction? Give its mechanism.
8. (a) Give the preparation reactions of alkanes from
(i) Carbonyl compounds (ii) Alkyl Halides
(b) Explain the following terms by giving suitable examples
(i) Nucleophile (ii) Electrophile (iii) Leaving group (iv) Substrate
9. (a) Write the nitration reaction of benzene with mechanism.
(b) How phenol is prepared from
(i) Chlorobenzene (ii) Sodium salt of Benzene Sulphonic Acid

Answers (Sahiwal Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
D	D	B	D	B	A	A	C	B	D	A	A	B	B	B	B	B

Answers (Faisalabad Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
B	A	D	B	C	A	C	C	D	B	A	D	D	B	B	A	A

Answers (Gujranwala Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
B	C	B	D	B	A	A	D	A	B	B	D	A	A	C	C	B

Answers (Sargodha Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	B	B	B	D	D	C	B	A	C	C	C	C	C	B	A	D

Answers (Multan Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	A	B	C	C	C	A	A	D	B	A	C	A	B	D	A	C

Answers (Bahawalpur Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	B	B	D	C	A	D	B	C	A	D	A	C	A	B	A	B

Answers (Rawalpindi Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	D	A	B	C	B	D	A	D	C	B	A	B	D	C	B	D

Answers (D.G Khan Board-I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
B	C	C	B	C	D	C	C	C	D	D	D	D	B	B	D	B

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